Abstract

Title of Dissertation: WHY DO THEY STAY? A STUDY OF HIGH SCHOOL MATH AND SCIENCE TEACHERS' PERCEPTIONS OF WORKING CONDITION FACTORS IN A LARGE URBAN SCHOOL DISTRICT

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In most U.S. school districts, a number of teachers are leaving the profession; more specifically, math and science teachers. Moreover, school working conditions are important predictors of teacher attrition and it is important to understand both when and how these conditions affect teachers. The purpose of this mixed methods study design was to explore the extent to which high school mathematics and science teachers perceive the importance of specific working conditions and the principal's control level in a large, urban, mid-Atlantic

school district. Using purposive sampling, the quantitative data collected used an anonymous web-based survey distributed to 246 high school math and science teachers at eight high schools while using six items to collect background information (gender, ethnicity, years of teaching experience, certification status, current position, and grade level currently being taught). The qualitative data collected were face-to-face interviews with the eight high school principals for augmenting the survey data with layered and detailed expressions specifically pertaining to teacher retention. The results of the study indicate that teachers perceive pedagogical matters as the most important factors to teacher retention and that principals have a high level of control over the physical plant of a school as a working condition factor that may influence retention. In contrast, the principals identified that they have little to no influence on the physical plant and that it could be a factor to teacher retention for their specific school. However, all of the principals identified professional development and support as working condition factors that were important to teacher retention and that the responsibility was completely under their purview.

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by

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Dedication

To God, I will do all I can to be worthy of Thee, O Lord. It all has to do with it. Thank you God. A Love Supreme. (John Coltrane)

To my wife Bridgette, whose patience, love, and support have been nothing short of perfection. Thank you for believing in me and always providing an encouraging word. To my daughter Bella, you were born during this process and have been my inspiration ever since. You are my latest—my greatest—inspiration.

To my mother, Phyllis, your calming resolve has been my energy and thrust in life. Your words of inspiration at the onset of this process have been my energy to complete this process. To my late father, my namesake, at my darkest moment you provided the motivation that has driven me. To my sisters, Robin and Tracy, your faith and belief have always given me strength. I cherish our sibling relationship.

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Problem Statement

In most U.S. school districts, a vast number of teachers are leaving their jobs at one school for another, or leaving the teaching profession altogether (Johnson, 2010; Baldacci & Johnson, 2006). Specifically, math and science teachers are significantly more likely to move from or leave their teaching jobs because of job dissatisfaction than are other teachers (Ingersoll, 2000). Furthermore, school work conditions are important predictors of teacher turnover and attrition, making it particularly important to understand both how and when these working conditions affect teachers (Shirrell, 2014; Boyd, Grossman, Ing, Lankford, Loeb, & Wyckoff., 2011; Ingersoll, 2001; Johnson, 1990, 2006; Johnson & Birkeland, 2003; Ladd, 2011; Loeb, Darling-Hammond, & Luczak, 2005). This study investigated the extent to which high school mathematics and science teachers perceive the importance of specific working conditions and the school principal's influence on those working conditions in a large, urban school district along the Atlantic coast—specifically named District B.

For school districts, teacher turnover is expensive and impacts student achievement, not to mention the costs associated with recruitment, hiring, and preparation of the new and/or replacement teachers (Locklear, 2010; Hirsch, 2005). District B is experiencing similar problems with teacher turnover, especially in mathematics and science despite attempts to address teacher retention through teacher recruitment and alternative certification. Unfortunately, District B faces a challenge to retain teachers within their first five years of teaching, resulting in a lack of consistent instruction and stagnant student achievement.

Scope of the Problem

In 2010, District B was ranked in the top twenty largest school districts in the nation (NCES, 2012). In its state, for the purpose of anonymity, it will be named Mid-Atlantic State or MAS (2014), District B was the second largest school district with over 123,000 students, 22,800 employees, and over 8,364 teachers, which comprised 36% of the workforce in the school district. Based on the most recent data (2016), of the 8,901 teachers, District B reported having 836 (8.6%) of teachers leaving the workforce and of those leaving, 478 (57%) of those teachers have five or less years of experience. In comparison to the state, with an overall teacher turnover rate of 7.1%, District B's teacher turnover (836) accounts for 18% of MAS's overall teacher turnover rate (MAS Teacher Report, 2016). See Table 1.1.

In 2015 – 2016, the state teacher attrition rate was 7.0%, while in comparison, District B ranked 2nd in the state at 8.6%. Upon closer examination, District B accounts for 26% of MAS's teacher attrition rate for teachers with five years or less teaching experience. Of even more importance is the number of teachers that left District B with five years teaching experience while accounting for over 50% of the overall teacher attrition rate in 2015 – 2016. This is significant if District B wants to focus its teacher retention efforts.

Table 1: Teacher Attrition, MAS P12 Dashboards, 2015- 2016

	< 1 year	1 to 5 years	6-10 years	11-15 years	16-20 years	21-25 years	26-30 years	> 30 years	Total Attrition	Total Teachers	Percent Attrition
State Total	**263**	**1,552**	**889**	**516**	**317**	**239**	**198**	**562**	**4,536**	**60,053**	**7.0**
District A	27	130	104	59	29	26	26	64	465	10,541	4.2
District B	**54**	**424**	**173**	**93**	**33**	**16**	**20**	**23**	**836**	**8,901**	**8.6**
District C	0	2	2	3	4	2	4	15	32	609	5.0
District D	5	7	6	1	0	0	0	0	19	229	7.7
District E	31	154	104	54	36	36	23	64	502	5,524	8.3
District F	2	15	12	9	6	6	5	19	74	1,061	6.5
District G	67	160	116	63	51	48	24	62	591	7,373	7.4
District H	2	6	1	5	1	2	1	5	23	518	4.3
District I	0	13	5	9	4	6	2	13	52	1,005	4.9
District J	1	3	0	1	1	0	0	1	7	156	4.3
District K	0	10	3	3	2	0	4	10	32	405	7.3
District L	8	56	62	39	31	24	24	54	298	4,148	6.7
District M	0	30	25	21	9	5	4	10	104	1,856	5.3
District N	0	2	2	3	0	0	0	0	7	39	15.2
District O	0	5	4	2	1	2	1	4	19	321	5.6
District P	2	9	8	4	1	1	2	1	28	386	6.8
District Q	21	296	91	52	50	22	14	70	616	5,264	10.5
District R	0	10	3	0	3	0	2	2	20	292	6.4
District S	11	40	38	11	5	1	1	17	124	1,791	6.5
District T	0	4	3	1	1	4	2	13	28	590	4.5
District U	2	17	19	14	5	2	2	20	81	1,160	6.5
District V	0	16	12	9	3	6	4	12	62	1,111	5.3
District W	18	57	35	15	16	9	15	22	187	2,609	6.7
District X	1	69	41	30	17	18	14	37	227	2,640	7.9
District Y	11	17	20	15	8	3	4	24	102	1,524	6.3

Historical Context

The Elementary and Secondary Schools Act (ESEA) of 1965 was signed into law by President Lyndon B. Johnson as a part of his comprehensive effort in a "War on Poverty." As a result of his resolve, this act has become the foundation of education policy and the most influential legislation that continues to impact education today. According to the provisions of the law, Title I was meant to address financial funding for the education of children of low-income families and to close the gap in reading, writing, and mathematics (ESSA, 1965). In a message to Congress (1965), President Johnson believed that our nation's schools needed to increase not only the quantity but also the quality of America's education system and that the best way to do this was to support the three Rs with the three Ts—teachers who are superior, techniques of instruction that are modern, and thinking about education, which places it first in all of our plans and hopes (Congress, 1965). This act stipulates that when quality teachers are in place to support the basic tenets of education, then student achievement is attainable and the only way to get there is by retaining quality teachers.

Policy

In 2001, President George W. Bush reauthorized the ESEA of 1965 by signing the No Child Left Behind Act (NCLB) into law. In this act, Bush acknowledges the need to address math and science preparation in order to prepare our students for college. According to NCLB, state and local school districts would receive an increase in federal funding based upon partnerships with the math and science departments at institutions of higher learning to strengthen the quality of math and science instruction in elementary and secondary schools and attracting math and science majors to teaching (Bush, 2001). In this case, NCLB is

specific about math and science as areas of teaching and learning that must be addressed through recruitment and retention of teachers in order to increase student achievement.

In 2015, President Barack Obama reauthorized the ESEA of 1965 by signing the Every Student Succeeds Act (ESSA) to redefine the federal government's role in education. Under Title II in this act, it addresses the preparation, training, and recruitment of high quality teachers and principals by identifying specific activities that state and local jurisdictions can do to receive additional federal funding. For example, establishing alternative routes to certification for science, technology, and engineering majors; career opportunities that allow for instructional coaching and mentoring; and differential pay or incentives for teachers in high needs areas such as science and mathematics (Act, E. S. S. 2015). The ESSA provides a definitive description of the activities state and local school systems can initiate or continue to develop to receive increased federal funding but more so to increase the overall quality of education and student achievement. Because of the guidelines established by the federal government, national science standards have been established that clearly define the outcomes of student achievement.

To address the need for national standards to increase student achievement, national standards have been established in which the primary belief is that "mathematics is the bedrock of science, engineering, and technology… Moreover, because of the rapid and almost unimaginable increase in the power of computers, advances in science now depend routinely on techniques of mathematical models" (Achieve, 2010, p.53). If this is the case, then to meet the challenge there is a need for a stable workforce of math and science teachers who can deliver the curriculum and teach consistently over the years. In 2013, the Next Generation of Science Standards (NGSS, 2013) were published to provide all students an

internationally benchmarked science education that is rich in content and practice and arranged in a coherent manner across disciplines and grades. The delivery of a curriculum rich in content and practice requires teachers who are also rich in content and knowledgeable about instructional practices to deliver the curriculum.

The Cost of Teacher Turnover

High teacher turnover brings a high cost to schools and school districts. The cost is twofold: impact on student achievement and the economic cost to the school system. The National Commission on Teaching and America's Future (NCTAF) estimates that the national cost of public school teacher turnover could be over $7.3 billion a year (NCTAF, 2007). This estimated cost is based upon the number of teachers who leave in a given school year, but does not account for hiring and recruiting, teacher induction, or any other cost associated with the hiring of a teacher. Despite a great deal of policy attention, teacher attrition remains a significant problem for our nation's public schools (Ingersoll, 2001, 2003; Keigher, 2010). It remains a problem because anywhere between 40 and 50 percent of teachers will leave the classroom within their first five years (Ingersoll, 2013). Recent national estimates show that 8% of public school teachers leave the profession each year (Keigher, 2010), while estimates from individual states show that 25-30% of new teachers leave during their first several years on the job (DeAngelis & Presley, 2011). Furthermore, teachers are more likely to leave teaching when they work in schools with large populations of poor, minority, and low-achieving students (Shirrell, 2014; Borman & Dowling, 2008; Boyd, Lankford, Loeb, & Wyckoff, 2005a; DeAngelis & Pressley, 2011 Feng, 2009; Hanushek, Kain, & Rivkin, 2004; Lankford et al., 2002; Scafidi, Sjoquist, & Stinebrickner, 2007).

According to the NCTAF Teacher Turnover Cost Calculator, the annual cost of teacher turnover for District B was $23,292,500 (Barnes, Crowe, & Schaefer, 2007). This cost was based on the amount the district spent on recruiting, teacher induction, and mentoring. Although teacher turnover has a price tag, there are some intangible losses such as teacher quality or student achievement, which are lost when a new, inexperienced teacher replaces an experienced teacher. More importantly, persistent turnover in a school's teaching staff disrupts efforts to build a strong organizational culture, making it difficult to develop and sustain coordinated instructional programs throughout the school (Johnson, Kraft, & Papay, 2012).

Mid-Atlantic State Staffing Report

Since 1986, The MAS Department of Education (MASDE) has conducted an annual study to determine critical teacher shortages and to publish an annual report, but since 2008 the report has been published biennially. In the report, four recommendations were made by MASDE to the state board: 1) there are 11 content areas in which there is a critical teacher shortage and math and science are two of those identified content areas, 2) there are 24 areas with a projected teacher shortage area and District B is identified as one of those areas with a projected teacher shortage, and 3) a shortage of teachers who are males, and a shortage of teachers who are members of minority groups (Mid-Atlantic State Teacher Report, 2018). Therefore, to address the identified teacher shortage, MAS monitors new hires by each school district (See Table 1.3) and by certification area (See Table 1.4) to establish trend data. MASDE relies upon each school district to provide accurate information.

Table 2: Teacher New Hires, MAS P12 Dashboards, 2015- 2016

District	Total New Hires 2015 - 2016
Total New Hires for MAS	5,714
District A	638
District B	**1,179**
District C	24
District D	33
District E	643
District F	107
District G	649
District H	35
District I	49
District J	5
District K	54
District L	354
District M	148
District N	1
District O	34
District P	61
District Q	690
District R	22
District S	236
District T	33
District U	100
District V	88
District W	265
District X	148
District Y	118

Supporting Data

National Data

Based on national data from the U. S. Department of Education, teacher retention and attrition data are analyzed by three distinct teacher patterns: “stayers” are those teachers who have decided to remain in their current school the same as their base year, “movers” are those teachers who have decided to continue teaching but moved to another school after their base year, and “leavers” are those teachers who have left the teaching profession after their base year (NCES, 2013). For the purpose of this study, teachers who leave the teaching profession will be identified as “leavers” and will be aligned to the data referred to as teacher attrition. According to the School and Staffing Survey (SASS) results from 2011 – 2012, the national teacher attrition rate is 7.7%, which is equal to the public school teacher attrition rate (Ibid., 2013). When this national data is separated by school characteristics, teachers with one to three years of teaching experience (7.1%) and natural science teachers (6.5%) are slightly below the national average; while on the other hand, high school teachers (7.8%), mathematics teachers (9.7%), and K-12 schools with students who are approved for free or reduced priced meals at 75% or higher have a teacher attrition rate (9.8%) higher than the national average (see table below). Unfortunately, the teacher or school characteristics from the (SASS) results cannot be cross referenced to provide an in-depth analysis; therefore, for the purpose of this study, high school math and science teachers in District B will be examined to determine the working condition factors that influence teacher retention.

Table 3: U.S. Department of Education, National Center for Education Statistics, Teacher Follow-up Survey (TFS), "Current Teacher and Former Teacher Data Files," 2012–13.

Number and percentage distribution of public school teacher stayers, movers, and leavers, by selected teacher and school characteristics in the base year: 2012 - 2013

Teacher or school characteristic in base year	Number				Percent		
	Total	**Stayers**	**Movers**	**Leavers**	**Stayers**	**Movers**	**Leavers**
Total	3,377,900	2,846,500	271,900	259,400	84.3	8.1	**7.7**
School Classification							
Traditional Public	3,264,900	2,754,400	260,400	250,100	84.6	8.0	7.7
Teaching Experience							
1-3 years	395,000	320,400	49,800	28,200	80.4	12.5	**7.1**
4-9 years	919,000	749,400	107,600	62,500	81.5	11.7	6.8
Main assignment field							
Mathematics	295,900	246,300	21,000	28,600	83.2	7.1	**9.7**
Natural Sciences	226,000	194,700	16,600	14,700	86.2	7.3	**6.5**
School Level							
High	987,800	844,400	66,500	76,600	85.5	6.7	**7.8**
Percent of K-12 students who were approved for free or reduced-price lunches							
75 or more	672,300	524,500	82,000	65,800	78.0	12.2	**9.8**

"Stayers" are teachers who were teaching in the same school in the current school year as in the base year. "Movers" are teachers who were still teaching in the current school year, but had moved to a different school after the base year. "Leavers" are teachers who left the teaching profession after the base year. Total numbers are rounded to the nearest ten. Detail may not sum to totals because of rounding and because some data are not shown.

According to the TFS, public school "leaver" teachers were asked whether their new occupation was better than teaching in 20 categories. According to the report: 1) (43.5%) of the respondents believed their salary was better at their new occupation, 2) (58.5%) of the respondents believed they had influence over workplace policies and procedures, 3) (52.8%) of the respondents believe their general work conditions were better in their new position, and 4) (32.6%) of the respondents thought that their relationships with colleagues was better in their new position. Based on this, less than the majority of the teachers who left teaching believe their salary is better or that their relationship with new colleagues was better. This indicates that financial compensation may not be one of the influential factors for teacher turnover and that collegial relationships are important to the social context of the work environment. In addition, if the majority of the teacher "leavers" determine that their new occupation does not provide strong relationships with their colleagues, then the work conditions of a school may need to be examined. School working conditions are often defined as those elements of teachers' workplaces unrelated to their pay or benefits (Johnson, 2006; Ladd, 2011).

Comparatively, every four years the U. S. Department of Education and the National Center for Education Statistics distributes the Schools and Staffing Survey (SASS). According to the results for 2011 – 2012, in table 210.20, titled "Percentage of teachers agreeing with statements about teaching and school conditions," teachers were surveyed in which they agreed or disagreed with 23 statements about school conditions (Goldring, Gray, & Bitterman, 2013). The results were then compared over four administrations of the survey and disaggregated by public school sector versus private school sector, and elementary versus secondary and combined schools. In the public school sector, 90% of the teachers surveyed

agreed with being a generally satisfied teacher at their current school. This is an excellent indication of the level of satisfaction for teachers in secondary schools; yet 30% of the secondary school teachers surveyed agreed that if they could get a higher paying job they would leave teaching as soon as possible and 51% were satisfied with their salary. This indicates that while monetary rewards are important to the satisfaction of teachers, they are generally satisfied with their school. This brings up an interesting point that teachers may not be satisfied with an occupation but are definitely satisfied with their school, which is their work environment. According to the research, 79% of the secondary school teachers surveyed believed there is a great deal of cooperative effort among the staff and another 76% believe that teachers at their school like being there. This is a positive indication that schools and their work environments significantly impact teacher satisfaction.

Nationwide in 2012, teacher demographics of the average high school math teacher are white, female, between the ages of 30 to 49, with a master's degree and teaching experience ranging from three to 20 years (See Table 1.4). In comparison, the average science teacher is white, female, between the ages of 30 to 39, with a master's degree and teaching experience ranging between three to nine years. For both math and science teachers, the majority of the teachers have experience of three years or more experience; on the other hand, the number of teachers new to teaching with three years or less experience is below 12% attributing to a possible diminishing supply caused by the various reasons for teacher attrition. Upon closer examination, of the math teachers (152,800) whose main teaching assignment is Math, only 64.5% studied math as the major field of study. Respectively, of the (132,900) Science teachers whose main teaching assignment was science, only 78.3% studied science as their major field of study. This may be indicative of a new hiring trend for school

districts that if the supply of newly certificated teachers in their respective field of study are not available, then they may have to hire less qualified teachers who did not teaching certification standards.

Table 4: SASS Survey, 2012: Demographics of school teachers grades 9-12 (2012)

		Math Teachers Percentage	Science Teachers Percentage
Gender			
	Male	42.7	46.4
	Female	57.3	53.6
Race			
	White	81.5	84.5
	Black	6.4	5.4
	Hispanic	6.2	5.1
	Asian	4.1	3.7
Age			
	Under 30	20.9	16.0
	30 -39	28.1	29.6
	40 – 49	24.7	25.7
	50 – 59	18.1	21.5
	60 over	8.3	7.2
Teaching Experience			
	3 or less years	11.6	10.0
	3 to 9 years	33.8	33.5
	10 to 20 years	34.5	35.8
	Over 20 years	20.1	20.7
Highest Degree			
	Less than Bachelor's	2.6	2.9
	Bachelor's degree	41.0	35.6
	Master's degree	49.8	51.8
	Educational Specialist	4.8	5.6
	Doctor's degree	N/A	4.0
Major Field of Study			
	Secondary Education	27.1	29.9
	Mathematics	64.5	3.0
	Natural Sciences	8.4	78.3

Mid-Atlantic State Data

The Mid-Atlantic State TELL (Teaching Empowering, Leading, and Learning) survey is a bi-annual perceptual survey that allows educators to TELL MAS if they have positive

teaching and learning conditions that researchers have shown to be important to student achievement and teacher retention (TELL survey, 2015). This survey is distributed to teachers, administrators, and other educators in which statements are provided and the respondent determines how strongly they agree or disagree regarding ten topics: demographics, time, facilities and resources, community support and involvement, managing student conduct, teacher leadership, school leadership, professional development, instructional practices, and new teachers and support. There are over 85,000 educators in MAS. Approximately 30,000 (35%) responded to the survey and the results of the responses are presented in percentages of agreement with the statement. When educators were asked to agree or disagree to overall statements regarding the factors that influenced their professional plans the responses were that collegial atmosphere (93%), support from school administration (93%), and facilities and resources (85%). This indicates that, in MAS, educators consider collegiality and support from the administrative team as one of the important factors impacting their decision to remain in teaching. On the other hand, only 78% of the respondents agreed with salary and 74% agreed with cost of living as being factors in making professional plans. This indicates that salary or compensation might not be the primary factor, in comparison to other factors, when deciding to remain or leave teaching. In response to the overall statement about their school being a good place to work and learn, (85%) of the educators agreed providing a favorable response.

District B Data

In reviewing the data from the MAS TELL survey for District B, there were approximately 9,000 educators and just over 2,000 (22%) respondents. In comparison of District B to the results for MAS, the results are similar. As it relates to the factors that

influence the professional plans of educators in District B, respondents identified collegial atmosphere (90%), support from the administration (91%), and facilities and resources as (85%). Although the percentages are minimally different, their influence on the future plans of educators is the same. Subsequently, (77%) of the educators agree that salary and cost of living (74%) are two of the least influential factors in their decision about making professional plans. The agreement response percentage (80%) is less favorable when compared to MAS in response to the statement that their school is a good place to work and learn. Unfortunately, the results of the TELL survey do not provide the in-depth analysis that would identify what a collegial atmosphere looks like or the type of support administration could provide. Researching that specific type of information requires more specific types of questions to determine a response to the "what" or "why."

Prior Attempts to Solve the Problem

Demand for Science, Technology, Engineering, and Math Teachers

On October 4, 1957, the Soviet Union launched the world's first satellite: Sputnik. In that moment, the United States acknowledged the importance of rigorous math and science curriculums in our public schools to maintain its status as a technology leader. For most people, it signaled the realization that there was a crisis in Science education, which prompted public demand to improve science education and provided the catalyst needed to stimulate and hasten reform (Kubota, 1997). Although this historical event initiated a reform in education, the current assessment data indicates that science and math instruction needs re-examination. According to the 2012 Program for International Student Assessment (PISA), among 15-year-old students, 29 education systems had higher average scores than the United States in mathematics literacy and 22 had higher average scores in science literacy (Department of Education, 2016). This data indicates that while there may not be a race to space, the math and science literacy of students in the United States is lagging when comparted to other education systems. Nationally, on the National Assessment for Education Progress (NAEP) in 2015, for the first time the average mathematics scores for 4th- and 8th-grade students were lower than the average scores in the previous assessment year. This further suggests that math and science instruction needs closer examination and that if the US wants to maintain its status as a leading innovator, there must be an increase in the rigor of science, technology, engineering, and math (STEM) courses to meet the challenge of advanced technology.

According to the United States Department of Education (2007), STEM education is defined as, Science, Technology, Engineering, and Mathematics education programs that are

primarily intended to provide support for, or to strengthen, (STEM) education at the elementary and secondary through postgraduate levels. For high school students, access to core and advanced STEM coursework is an essential part of preparing to enter the workforce equipped with relevant skills for a broad range of jobs and to successfully pursue STEM degrees and courses in college (White House Office of Science and Technology, 2016). Hence, the recruitment and retention of Science and Math teachers is critical to the preparation and development of students for STEM related careers. Ultimately, the rigor and opportunity for a STEM education must allow all students to be a part of the STEM vision and teachers being provided with professional development opportunities that allow them to guide their students towards STEM literacy (Kennedy & Odell, 2014). More importantly, the retention of Math and Science teachers is critical to success for a STEM education.

National Policy

According to the results of the School and Staffing Survey (2012), teacher turnover is 7.7% on a national level. Although this may seem insignificant, it is indicative of a problem that could be much higher in some states while much lower in others. As a matter of fact, several studies indicated that teacher turnover is a major problem in education due to the number of teachers leaving the profession outnumbering the number of teachers entering or staying in the profession (Johnson, 2010; Futernick, 2007; Johnson, Berg & Donaldson, 2005; National Commission on Teaching and America's Future [NCTAF], 2003). Therefore, the problem is affecting the education system nationwide. In addressing teacher turnover as a supply side problem, teacher preparation programs have been identified to increase the number of teachers entering the field of education. For example, a proposal from the U.S. Department of Education would redirect aid from the existing Teacher Education Assistance

for College and Higher Education (TEACH) Grant Program towards students at programs that have historically graduated more effective teachers (U.S. Department of Education, 2011). In doing so, this would push post-secondary institutions to develop a more rigorous program to attract and develop teacher candidates. However, Goldhaber & Cowan (2014) conducted a study using data from Washington State and teacher labor market decisions for teachers across 20 programs over a 22-year period. Based upon their results, they suggest that if policymakers would tie licensure or student aid eligibility to attendance at specific preparation programs then they would know the difference in teacher quality.

Another solution to reduce teacher turnover is teacher induction and mentoring as a support system throughout the early years of their career. Research has shown that teachers who lack adequate initial preparation are more likely to leave the profession than are those teachers with adequate preparation (Darling-Hammond, 2003). This initial preparation of new teachers has the ability to provide a support system that could benefit new teachers in their growth process to becoming experienced teachers. The challenge is and remains in the variance and duration of teacher induction and mentoring from one school district to another. Therefore, the challenge remains that although more than half of the states require some kind of induction program, few provide the majority of beginning teachers with all four of the common components: mentoring, reduced preparation/course load, seminars/workshops, and supportive communication with a principal or department chair (Haynes, 2014).

Attempts by Mid-Atlantic State to Reduce Teacher Attrition

Historically, MAS has had a shortage of teachers in certain content areas in which they have imported teachers from other states that produce more teachers than needed (Mid-Atlantic State Teacher Report, 2015). In order to address this problem, the state has instituted

scholarships for shortage areas in order to meet the demand. They have enacted stipends for potential and continuing teachers, along with state tax credits for teachers who are enrolled in college courses. They have offered alternative certification programs for those with a liberal arts degree or career changers and instituted a mentorship program, *"teachers of promise,"* which matches teacher of the year winners with promising seniors at the statewide universities and colleges. Moreover, in an effort to secure "Race To The Top," a law was passed in 2010 making teacher induction programs mandatory for all school districts. According to the policy, it requires each local school district to establish and maintain a comprehensive induction program for all new teachers until they receive tenure (13A.07.01.04, COMAR, 2014). While this policy addresses the need for induction and mentorship, it does not provide an implementation plan of specified topics to address or how the teacher will build a relationship with colleagues and the principal.

Attempts by District B to Reduce Teacher Attrition

District B continues to create an environment that motivates all educators to remain and prosper in the school system, and become highly qualified and highly skilled and effective in their profession. It accomplishes this by providing effective supports, systematic interventions, and instructional leadership opportunities to teachers (District B, Master Plan 2014 Update). Within this statement, District B acknowledges that there is a challenge to retain educators in the school system. One of the reasons identified is that "high teacher resignations are the product of continuous budget challenges that limit the ability of the school system to provide retroactive salary increases for teachers remaining with the school system" (District B, Mater Plan 2014 Update). This is based on the fact that in 2013 – 2014,

District B remained sixth in the Washington metropolitan area for teacher compensation and that exit survey data indicates compensation is the one of the top three reasons for leaving.

Each year in August, new teachers to District B must participate in the "Professional Educator Induction Program" (PEIP), an activity designed to assist with developing their skill and provide them with an understanding of the school system. In the 2016 – 2017 school year, PEIP became a monthly professional development offered to non-tenured teachers to support their professional practice. The monthly PEIP professional development sessions were held afterschool at one designated location and teachers needed to register in advance to attend. Recently implemented during the 2014-15 school year, the school system initiated the Peer Assistance and Review (PAR) program. This program was designed to provide intensive and differentiated support to non-tenured teachers in need of improvement in the area of professional practice. This program stresses the mentoring of beginning teachers as they progress over the years towards tenure. Lastly, as support system for teachers who are seeking alternative certification, mentoring is provided through "Mid-Atlantic Approved Alternative Preparation Program (MAAPP) in which upon acceptance, participants are provided a standard professional certificate and highly qualified status in exchange for a two- to three-year commitment. This program was designed to reduced teacher turnover while providing an alternative path to certification for career changers.

Literature Review

> One of the things that I've been focused on as President is how we create an all-hands-on-deck approach to science, technology, engineering, and math… We need to make this a priority to train an army of new teachers in these subject areas, and to make sure that all of us as a country are lifting up these subjects for the respect that they deserve.
>
> *Former President Barack Obama*
> *Third Annual White House Science Fair, April 2013*

This literature review will focus on the factors that influence the retention of high school math and science teachers. This will be accomplished by examining the following factors: the efforts to retain math and science teachers, teacher induction, the impact of working conditions, collegial support, and student achievement on job satisfaction to determine its influence in the decision making process of teacher retention. In addition, this analysis will examine the role of the principal and their influence on teacher job satisfaction leading to the retention of math and science teachers.

Math & Science Teachers

The retention of math and science teachers is more challenging than any other content area because of their ability to seek other job opportunities with greater status and reward than teaching. According to research, a descriptive analysis of the type of teachers who leave the profession have suggested that math and science teachers tend to leave the profession at higher rates than do teachers of other subjects (Grissmer & Kirby, 1992). In addition, while teacher turnover is a challenge, "analysts have hypothesized that mathematics and science

teachers are more likely to leave at higher rates because they are more likely than other teachers to have alternative career options in the business and technological sectors, often with higher salaries" (Ingersoll & May, 2012; Murnane, et al., 1991; Rumberger, 1987). While alternative career options and higher salaries influence the decision of whether a math or science teacher remains in the profession, there are factors that influence them to remain in teaching. More importantly, with different work opportunities in the United States, most of those in the workforce engage in different occupations over their lifetime, which results in people moving in and out of teaching more frequently than before (Luft, Wong, and Semken, 2011).

One of the factors that influence the retention of math and science teachers are the working conditions that they must endure. For example, a study was conducted using the data from the Teacher Follow-Up survey of 1995 focusing on math and science teachers in comparison to all other teachers to summarize the rates and reasons for teacher turnover. Based upon the results, math and science teachers are significantly more likely to move from or leave their teaching jobs because of job dissatisfaction and the most common reasons were low salaries, a lack of support from the administration, and lack of influence over school decision-making (Ingersoll, 2000). In 2006, a similar study was conducted using the data from the Teacher Follow-Up survey in 1994-95 and 2000-01, noting that the teacher turnover rate for math and science teachers is higher than for teachers in some other fields and that the way to improve teacher retention is to improve the conditions of the teaching job (Ingersoll, 2006). By examining the conditions of teaching, school districts may gain insight on how to retain math and science teachers by identifying the factors that have the greatest impact on teacher retention.

For the purpose of this study, math and science teachers are grouped together because the recruitment and retention challenges are similar. For example, a quantitative survey was conducted in which administrators from six urban school districts were interviewed regarding their challenges with recruiting and retaining math teachers and it was identified that support and working conditions are particularly important, because teachers' career decisions are motivated by both extrinsic and intrinsic rewards and their ability to obtain the latter are heavily influenced by the conditions that they find within their school and district (Liu, Rosenstein, Swan, and Khalil, 2008; Johnson & Birkeland, 2003; Liu, Johnson, & Peske, 2004; Lortie, 1975). Therefore, the importance of teacher retention for math and science might be better explained by Ingersoll and Perda (2009), who argue that the turnover of mathematics and science teachers is especially important to address because these fields do not have the same large ''cushion'' of new supply enjoyed by fields such as English.

Teacher Induction

The retention of science teachers is a national challenge that continues to impact educational systems. For example, a study in Arizona focused on the reasons for teacher attrition and migration among beginning high school Science teachers and the influence of an alternative support induction program on their decision making to remain in teaching and determined that 20% of all high school teachers left the profession within their first three years. This data was compiled with interviews from teachers at the beginning and the end of the school year, and as a result, two significant themes emerged as influential factors upon retention and turnover: challenges within school context (administrative support, workload, collegial interaction, and student issues) and challenges with teaching assignment (teaching more than one subject in a content area, for example). Based upon those factors, it was

concluded that teachers who left the profession did so due to school context and those who migrated to other schools did so because they were teaching outside their academic major and found opportunities at other schools with the researchers recommending that instability in the teaching force is not only a problem of supply and demand, but also a problem of both school context that were less than ideal as well as inappropriate placement (Patterson, Roehrig, and Luft, 2003).

Working Conditions

The organization and characteristics of a school may influence whether a teacher moves to another school or leaves the profession. In the article, "Teacher Turnover and Teacher Shortages: An Organizational Analysis," Ingersoll provides an analysis of the possibility that there are other factors—those tied to the organizational characteristics and conditions of schools —that are driving teacher turnover and, in turn, school staffing problems (Ingersoll, 2001). In this study, the author utilizes quantitative data from the 1990-91 School and Staffing Survey (SASS) and the 1991-1992 Teacher Follow-up Survey (TFS) to identify teachers who left teaching altogether and what school characteristics were prevalent. The results of the study provided numerous findings that may help school districts identify why teacher turnover is very high. One of the key findings is that teacher turnover is higher in schools with high poverty levels. "Approximately 25% of the teachers reported job dissatisfaction due to one of the following reasons: low salaries, a lack of support from the administration, student discipline problems, lack of student motivation, and lack of influence over decision-making" (Ingersoll, 2001). This is indicative of how the characteristics of a school can influence whether a teacher stays or leaves.

In Arizona, Berry & Fuller (2007), used a survey that was distributed to all state licensed educators and the results revealed that teacher perceptions of their overall school environment and the degree to which they believe that they are respected is directly related to their intent to stay at their current schools. In another study, research was conducted to analyze the results of The Mississippi Teacher Working Conditions Survey and the results of the survey indicated that teacher perceptions of school leadership are directly related to their intent to stay at their current schools (Berry & Fuller, 2008). Although both studies were conducted in different states their primary purpose was to gain more information about teacher turnover and working conditions. This acknowledges that across the states a solution to a consistent problem is being sought.

Ladd (2011) used a quantitative study analyzing administrative data for North Carolina combined with the results of a 2006 statewide survey administered to all teachers in the state to document the working conditions that were highly predictive of a teacher's intended movement. In this study, working conditions for teachers are defined as "the physical features of the workplace, the organization structure, and the sociological, political, psychological and educational features of the work environment" (Johnson, 2006; Johnson et al., 2005). In order to effectively use the results of the data, the author aligned questions and responses based upon level of school—high school, middle, and elementary—and several leadership factors: expanded roles, time factors, professional development, facilities and resources, teacher evaluation, school characteristics, salary data, and teacher characteristics. Using these factors, the author tabulates the data to demonstrate a regression model between respond plans to leave school and the average working conditions in the school. As a result, the main conclusion is that variation across schools in working conditions as perceived by

teachers is highly predictive of individual teachers' intentions to leave their current schools, and the most dominant working condition factor is the data indicating if there is a high perceived quality of leadership, then teachers are less likely to plan to leave or actually do leave, especially at the high school level (Ladd, 2011). The results of this study indicate working conditions and leadership are positively correlated predictors of teacher retention aligning with the purpose of this study.

In a recent study, it was determined that "the relationship between student demographics and teacher turnover is driven not by teachers' responses to their students, but by the conditions in which they must teach and their students are obliged to learn" (Johnson, Kraft, & Papay, 2012). This statement supports the purpose of the current study in which teacher turnover may be the result of working conditions as the most influential factor. In the study "The Effects of Teachers' Working Conditions on Their Professional Satisfaction and Their Students' Achievement" (Johnson, Kraft, & Papay, 2012), the authors examine how work conditions predict both teachers' job satisfaction and their career plans while paying attention to the interpersonal and organizational contexts in which teachers work. In this study, the authors combined a statewide survey (MassTeLLs) of working conditions with demographic and student achievement data from Massachusetts. Based on the results of the study, the conditions in which teachers work matter a great deal to them and their students. Teachers were determined to be more satisfied and planned to stay longer in schools that have a positive environment separate from the school's demographic characteristics. Furthermore, it was identified that working conditions like a clean and well maintained facility or modern technology were important; however, it was the social conditions of the school that were most important: "the school's culture, the principal's leadership, and

relationships among colleagues—that predominate in predicting teacher's job satisfaction and career plans" (Johnson, Kraft, & Papay, 2012). This indicates that there is more to working conditions than physical or material evidence; working conditions are more a reflection of everyday feelings or actions.

Larger numbers of teachers leave schools serving high proportions of low achieving, low-income, and minority students, which creates high turnover rates. This creates a number of potential challenges ranging from lack of continuity in instruction, lack of adequate teaching expertise, providing support and mentoring, and lost time and resources for replacement and training (Loeb, Darling-Hammond, & Luczak, 2005). According to Ingersoll (2001), 33% of all beginning teachers leave within the first three years and 46% have left the profession within five years. Additionally, research has also shown that teachers are more likely to remain if they make it past their fifth year of teaching (Murnane, Singer, & Willett, 1988). Teachers who decide to leave the profession may do so because of stress, lack of support, student behavior, perceived lack of support from the leadership, or other working conditions; meanwhile, those who remain may do so because of supportive leadership, collegial support, and positive working conditions. Ultimately, the conditions that teachers work under matter a great deal to them and their students (Johnson, Kraft, & Papay, 2012). These positive working conditions allow teachers to develop trusting social relationships with their colleagues that construct the context for their work. Teachers are likely to stay in schools where they view their colleagues as partners in the work of improving the whole school and the conditions are well suited for them to have the potential to be effective (Allensworth, Ponisciak, & Mazzeo, 2009). Even more so, the conditions in which teachers

instruct their students are the same conditions in which students learn, thereby making both groups interdependent on the conditions in which they work.

Collegial Support

The amount of support that teachers receive is based upon the culture and organization of the school. Collegiality, or a sense of working together for a common good, has been shown to increase teacher retention rates (Locklear, T, 2010.; Kardos, 2001). This feeling of collegiality is important for teachers because they need support and a feeling that they are part of a bigger goal. According to researchers, new teachers enter the profession with a tentative commitment to teaching (Peske, Liu, Johnson, Kauffman, & Kardos, 2001) and decide whether to continue teaching based on the support they receive at the school site and the success they experience with their students (Johnson & Birkeland, 2003; Johnson et al., 2001). As a result, school districts should seek to determine the specific types of support that influence teacher retention.

In a qualitative study on professional cultures of a school, the authors describe three types of school cultures that new teachers may experience: a veteran-oriented culture, a novice-oriented culture, and an integrated culture. In the study, an integrated culture is characterized as a place where teachers realize their strongly held beliefs about the importance of collegiality, communication, and cooperation were the norm, and teachers shared a collective responsibility for educating all students (Kardos, Johnson, Peske, Kauffman, & Liu, 2001). The results of the interviews indicate that a new teacher in an integrated culture could have positive effects on student achievement, novice teacher retention, and veteran teacher retention. With these results to consider, teacher retention in

any school district could increase when new and veteran teachers work together to create a collegial environment.

In a study published by the Consortium on Chicago Schools Research, they found that teachers are more likely to remain in schools where they have positive working relationships with each other—where they feel that their colleagues are innovative, that is, where teachers work together on improving the school and that collective responsibility and perceptions of innovation among colleagues are related to teacher mobility at the high school level (Allensworth, Ponisciak, & Mazzeo, 2009). Using disaggregated data from a survey on school climate and instruction, researchers were able to make generalizations about teacher attrition and turnover based on their perceptions measured through survey questions on learning climate, student-teacher relationships, leadership, and quality of the school's instructional program, the school's professional environment, and the nature of the school's relationships with parents and the community.

Student Achievement

If students are to achieve, then schools must create a positive learning environment where students can grow. In this environment of student achievement, schools must have a stable teaching workforce to establish its growth and continuance. On the other hand, some researchers have found that teaching lower achieving students is a strong factor in decisions to leave and the magnitude of the effect holds across the full range of teaching experience (Hanushek, Kain, & Rivkin, 2004).

The correlation between teacher retention and student achievement has been examined in various ways to determine if there is a definitive relationship. In a state-specific study conducted in New York City, the relationship between elementary, high achieving

teachers working in schools with low performing students was examined to determine the impact on teacher retention. Teacher data was gathered from 1995-1996 through the 2003-2004 academic years of teachers with 5 years or less experience to determine patters of teacher turnover. The results of the study revealed that highly qualified teachers are more likely to transfer or quit when teaching lower-achieving students (Boyd, Lankford, Loeb, & Wyckoff, 2005). The results of this study imply that lower achieving students are at a disadvantaged impacting school culture and learning if highly qualified teachers are leaving and creating a vacancy.

In a study conducted to measure the importance of principal leadership on student achievement, the authors examined teacher retention as a factor of principal effectiveness. Based on the results, it was concluded that principals affect school quality when they manage teacher quality and that improvements in teacher effectiveness can raise the quality of education (Branch, Hanushek, & Rivkin, 2013). This implies that the influence of the principal on teacher effectiveness and the school as a whole can impact student achievement.

In another state-specific study, the effects of teacher turnover were examined using administrative data and observations for over 850,000 New York City fourth and fifth grade students during an eight-year academic time period. Using this data, the authors were able to link math and English language arts skills to student, class, school, and teacher characteristics. The results of the study indicate that teacher turnover has a harmful influence on student achievement since it can reach beyond just those students of teachers who left or of those that replaced them and that turnover negatively affects collegiality or relational trust among faculty, or perhaps resulting in loss of institutional knowledge among faculty that is critical for supporting student learning (Ronfeldt, Loeb, & Wyckoff, 2013). The implications

of this study indicate that teacher retention impacts student achievement for a school building and for school culture in establishing a stable workforce.

Principal Support

In a school, principals are the leaders of their building and their support or lack thereof can have a substantial influence on a teacher's decision to leave or remain in teaching. The influence of a principal can directly impact working conditions, collegial support, student achievement, and job satisfaction. Ladd (2009), for example, analyzed teachers' responses to North Carolina school climate surveys and finds that teachers' perceptions of school leadership are more predictive of teachers' intentions to remain in the school or to find alternative jobs than are their perceptions of any other school working condition.

Finnigan (2011) argues that transformational leadership behaviors influence teacher motivation and student performance. In a qualitative study of three low performing schools in Chicago, the research indicated that principal leadership is critical to low performing schools with the implication that school districts should develop policies to hire principals that are proven and have the ability to support and motivate teachers in low performing schools.

Richards (2003) conducted a study that examined K-8 teacher beliefs about their principals' behaviors and attitudes and whether or not it encouraged them to remain in teaching. In this study, teachers were interviewed wherein a list of 22 principal behaviors were generated and then ranked by teachers and principals. Based on the results, one of the most important findings is that positive teacher-principal relationships equal satisfied teachers who are likely to remain in teaching. This furthers the point that principals have a direct impact on teacher retention.

In a quantitative study conducted in North Carolina that examined the concerns and problems experienced by novice science teachers, it was noted that although all of the participants felt that they had received excellent support from other teachers and administrators, their reasons for leaving teaching would revolve around issues of job satisfaction, recognition, and compensation (Watson, 2006).

In 2011, a quantitative study was conducted using the results of a survey distributed to all first-year teachers in New York City to examine the relationship between teacher turnover and teacher characteristics, student body characteristics, school characteristics, and administrative support. Based upon the results, the authors concluded that school administration is an important factor in teacher retention decisions but did not provide information about how or why administrative support affects teacher retention (Boyd, et al., 2011). This implies that there is a correlation between administrative support and teacher retention, but there are no descriptors of how or why administrative support affects teacher retention.

Jackson (2012) used three theories of school leadership—shared decision making and participatory governance, distributed leadership, and teacher leadership in conjunction with the data from the 1999–2000 School and Staffing Survey (SASS), to examine the perception of principals and their own influence over school policy in teacher retention decisions. The recommendations from the study indicate that school leaders should create opportunities for teachers to participate in the decision-making process, construct a system for teacher concerns to be communicated, and know that their professional judgment is valued.

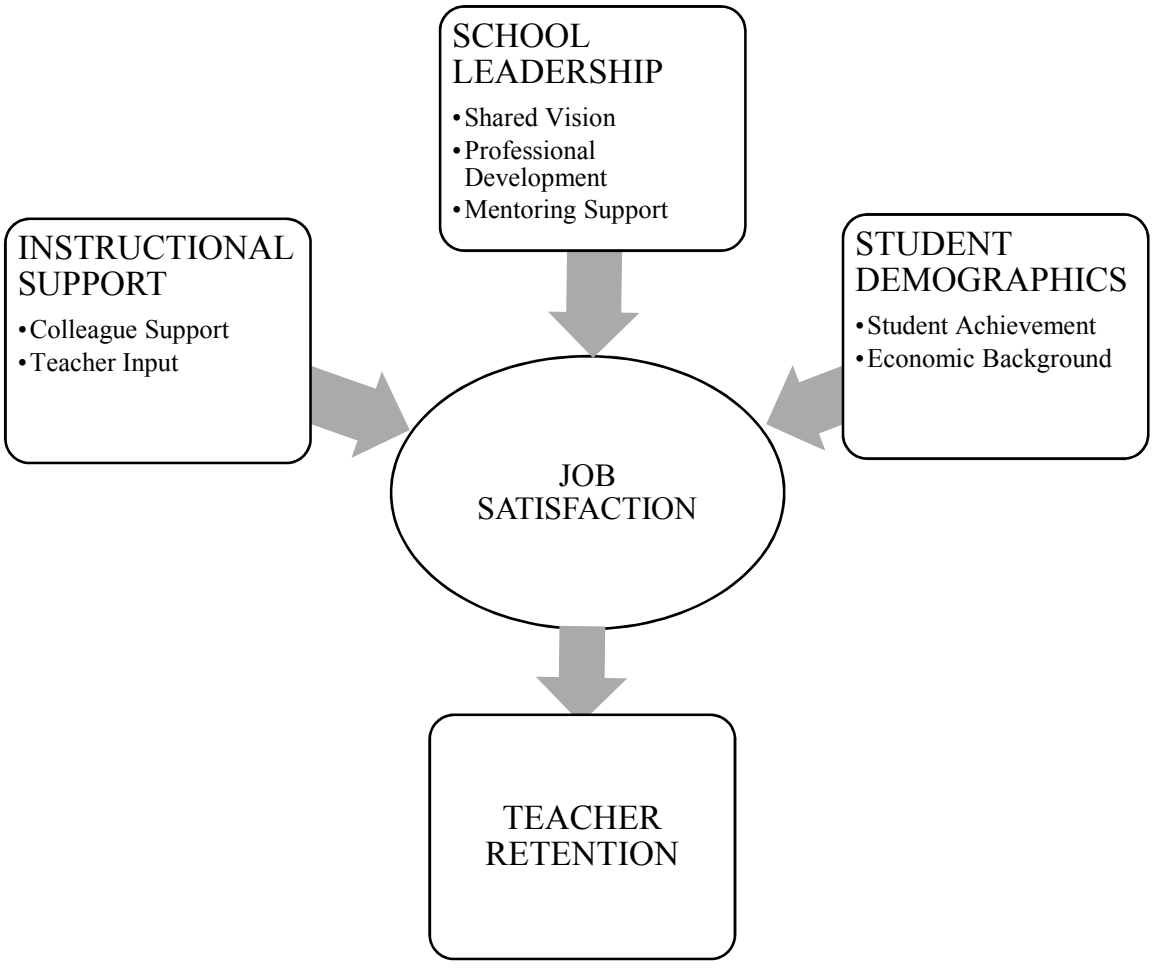
Principals play a vital part in improving teacher retention by providing guidance, support and offering instructional and institutional resources (Hughes, Matt, & O'Reilly,

2014). In this research design, a survey was distributed to teachers and principals of traditionally hard-to-staff schools regarding their experiences of perception around support and how it affects teacher retention. Based on the results of the survey, several recommendations were made to principals and policymakers to foster support of teachers in hard-to-staff schools ranging from receiving more positive feedback and recognition to more opportunities for professional development. This supports that importance of the role of the principal and the perception of support to increase teacher retention in schools.

Conceptual Framework

In this conceptual framework, high school math and science teacher retention is influenced by school climate, student demographics, and principal support. Poor working conditions are a majority reason for dissatisfaction among teachers and cover a variety of areas including but not limited to workplace conditions, lack of collegial support, excessive paperwork, lack of planning time, and resources (Futernick, 2007; Luekens, 2004). On the other hand, some researchers believe "it is the principal's responsibility as leader of the school to create a positive environment that supports the growth of both teachers and students" (Clement, 2000). Therefore, in order for teachers to have the motivation, and confidence to meet the needs of the diverse student population today, principals must provide them with strong leadership, collaboration, and shared vision (Locklear, 2010; Blase & Blase, 2004).

Figure 1 – Conceptual Framework – Working Condition Factors



Chapter 2: Investigation

In this section, I will address the details of my study to identify high school math and science teachers' perceptions of working condition factors that influence teacher retention. I will also address principals' beliefs of their influence on retention of high school math and science teachers.

Research Questions

Based upon the review of literature, a conceptual framework has been developed identifying working condition factors such as instructional support, school leadership, and working conditions as factors that influence math and science teachers to remain in teaching. Therefore, the following research questions guided my study of high school math and science teacher perceptions towards working condition factors and the principal's influence on teacher retention.

1. What importance do high school mathematics and science teachers place on various instructional support and school leadership factors as an influence on working conditions, and what is the perceived control level of school principals on these instructional groups and school leadership factors?
2. What specific working conditions do high school mathematics and science teachers report as influencing their decisions to remain in the school district, and what is the perceived control level of school principals on the working conditions?
3. Does the influence of working conditions differ among high school mathematics and science teachers based on teaching experience and other background characteristics?
4. How do high school principals perceive their influence on the retention of high school mathematics and science teachers in their buildings?

Study Design

Quantitative and qualitative data was collected and analyzed separately for this descriptive study. Research questions 1, 2, and 3 utilized data from an online anonymous survey of teachers. A mixed methods approach was used to answer research question 4. Creswell (2015) refers to this as mixed methods design, which involves the collection of and analysis of both quantitative and qualitative data in response to research questions.

Surveys are important because they allow for easy distribution to a large number of individuals and upon completion facilitate rapid analysis of the data. They are preferred because of time savings, low cost, and quick turnaround (Johnson, 2010; Creswell, 2003; Mills, 2003). Survey research can be advantageous in terms of anonymity, as respondents who might be difficult to recruit in person might feel safer disclosing their feelings or opinions from the comfort and privacy of their home environments (Johnson, 2010; Van Selm & Johnson, 2006). A survey allows researchers to provide questions specific to their research and obtain responses that either support or refute their theory.

For the qualitative portion of this study, a narrative research approach was used to interview eight high school principals to gain a deeper focus about their beliefs regarding the retention of high school math and science teachers. The goal of narrative research in education (Gay, Mills, & Airasian, 2014) is to allow people to tell the stories about the world around them and gain an increased understanding of central issues related to teaching and learning through the telling of stories.

Methods

The following section describes the participants in the study, the survey instrument, the procedures for the study and the analysis.

Participants

The participants for this study were from a large urban school district in the mid-Atlantic region of the United States. The school district, which will be called District B, has a student population of 130,000 students, 208 schools and centers, and 19,000 employees. Currently, there are 31 high school programs. The participants for this study were all grades 9 – 12, math and science teachers assigned to one of eight traditional high schools that met the criteria. The criteria for selection were from the 21 traditional high schools based on their FRPL population. According to NCES (2017), the percentage of students eligible for free or reduced-price lunch (FRPL) under the National School Lunch Program provides a proxy measure for the concentration of low-income students within a school and public schools are divided into categories by FRPL eligibility. High-poverty schools are defined as public schools where more than 75.0% of the students are eligible, mid-high poverty schools as those where 50.1 to 75.0% of the students are eligible, mid-low poverty schools as those where 25.1 to 50.0 % are eligible, and low-poverty schools are those where 25.0% or less are eligible.

In District B, there were no high schools identified as a low poverty school with a FRPL population of 25% or less and there was only one high school identified as a high poverty school with a 75% or higher FRPL population. Therefore, the four high schools with the largest FRPL percentage and the four high schools with the lowest FRPL percentage were selected because studies of teacher leavers have found that teachers leave schools with larger

proportions of low-income and minority students at higher rates than other schools (Loeb, S., Darling-Hammond, L., & Luczak, J. (2005), Shen, 1997).

In order to preserve the anonymity of schools and teachers, the participating high schools were identified as HS1 through HS8, beginning with the schools with the lowest FRPL percentage.

Table 5: MAS, as of October 31, 2016 FARMS Report. Published January 20, 2017

High School	FARMS Population	Total school population	FRPL %
HS 1	**653**	**2,377**	**27.47%**
HS 2	**320**	**993**	**32.23%**
HS 3	**295**	**886**	**33.30%**
HS 4	**980**	**2,516**	**38.99%**
HS 5	**1,543**	**2,333**	**66.14%**
HS 6	**1,550**	**2,298**	**67.45%**
HS 7	**1,323**	**1,934**	**68.41%**
HS 8	**2,064**	**2,610**	**79.08%**

Teachers.

All grade 9 -12 teachers in the eight selected high schools who have their primary teaching assignment in math or science were administered a web based survey using the Qualtrics platform. There was an average of 31 math and science teachers per school who were eligible to complete the survey creating a survey sample of 246 teachers.

Principals.

The main administrator or the principal of each of the eight high schools completed the survey and were interviewed using a semi-structured interview of approximately thirty minutes. The resident principal at one of the high schools, HS 2, completed the survey but

was not interviewed. The principals were selected because their schools were identified based on the criteria for selection and they were directly responsible for the everyday operations of the school.

Instruments

The researcher used two instruments to conduct the research. The first instrument was created on the Qualtrics platform to distribute an anonymous web-based survey that was administered to high school math and science teachers and principals at eight selected high schools. The second instrument was a semi-structured interview guide of questions that was used to interview principals of the eight high schools where the surveys were distributed**.**

Survey Instrument. Survey research requires the collection of standardized, quantifiable information from members of a population sample to test a hypothesis about a particular topic or issue (Gay, Mills, & Airasian, 2014). This study used a web-based (Qualtrics), cross-sectional survey design and was distributed to high school math and science teachers in District B and it has provided statistical data about trends in working condition factors that influence teacher retention.

TELL Maryland. TELL Maryland (Teaching, Empowering, Leading and Learning) is an anonymous, statewide survey licensed school-based educators and designated education support personnel to assess teaching conditions at the school, district and state level. The state's education leaders want to ensure that every Maryland educator has the supportive environment necessary to help students achieve at the highest levels.

For the purpose of this study, I used an anonymous modified version of the 2015 TELL Maryland survey to address research questions 1, 2, and 3. The Maryland TELL survey identified the following areas of working conditions: time, empowerment, leadership, decision-making, and facilities and resources, as related to future employment plans. The TELL Survey incorporates these constructs and additionally includes others logically and empirically linked to outcomes of interest, teacher retention and student learning. These constructs include: student behavior support, community support, and instructional practices and support. Thus, the TELL Survey currently includes eight constructs (New Teacher Center, 2013).

The TELL survey was validated and determined to be reliable by an external reviewer (Swanlund, 2011, cited in New Teacher Center, 2013), who used data from eleven states. In addition, NTC conducted its own validity and reliability analyses on the TELL Maryland survey. NTC's confirmatory factor analysis (CFA), using principal components analysis and varimax rotation procedures, confirmed that the actual structure of the data reflected the expected structure from the external validity study. Reliability analyses for the TELL Maryland survey found Cronbach's alpha coefficients for the eight constructs ranging from 0.83 to 0.95, confirming the internal consistency of the constructs (New Teacher Center, 2013).

Survey Instrument. The survey instrument used in this study is adapted from the TELL Maryland survey. The first step in adapting the survey involved the researcher identifying 36 statements from the TELL survey that aligned to the three areas of the conceptual framework: instructional support, school leadership, and working conditions. As a

result, 12 statements were aligned to each area of the survey. The second step involved creating the directions for the survey and the scale of response.

The directions for the survey instructed teachers and principals to respond to each statement, regarding working conditions, using a Likert scale of (1 – 10) reflecting their belief about the level of importance to them and the amount of influence they believe a principal has on each item. The reason for the 10-point Likert scale is that there is no neutral point within the rating scale affixed to each item, but rather respondents are "forced' to provide definitive feelings toward each item. Any item for which a respondent has difficulty or discomfort responding, instructions are given simply to skip the item. The survey included six demographic questions regarding respondents' current position, years of teaching experience, certification status, ethnic background, grade level taught, and gender. The survey is in Appendix B.

Interview Questions. An interview is a purposeful interaction in which one person obtains information from another and it allows for the researcher to obtain important information by probing participants' responses to gather in-depth information (Gay, Mills, & Airasian, 2014). The researcher interviewed the eight principals of the high schools that met the criteria of student FRPL population. Using a semi-structured interview process, the researcher elicited views and opinions from the participants (Creswell, 2015). The semi-structured interviews utilized eight open-ended questions. The researcher probed to obtain background and context information so that principals elaborated their responses and provided insightful detail. The interviews were conducted within a 30-minute time frame. The responses from the open-ended questions were used to evaluate principals' perceptions of their support

for teacher retention, which assisted to better understand the working condition factors that impact teacher retention. The interviews allowed for principals to reflect on their leadership role and respond to questions regarding their perceptions on teacher retention and specific strategies they utilize to encourage teachers to remain in the teaching profession.

Procedure

Survey. The principals of the selected eight high schools were contacted via email with an attachment letter requesting their permission to distribute the survey by obtaining the email addresses of their math and science teachers. High schools often vary in size based on the student population directly impacting the size of the staff. Based upon the criteria, there were on average 15 teachers for each math and science department per school. Therefore, there were 246 high school math and science teachers from the selected schools. With the consent of the principal, the researcher requested the total number of math and science teachers and the email addresses of those teachers who teach a math or science course within their respective school. Upon obtaining the email addresses of the math and science teachers, an email was sent to the principal and math and science teachers with an attachment letter from the researcher explaining the purpose of the study, timelines, potential benefits to the district, a letter of consent, and an anonymous link to the web based survey developed using the Qualtrics platform.

The survey lasted no longer than 30 minutes to complete. The survey questions are grouped into the following categories: instructional support, school leadership, and working conditions. Participants were able to complete the survey on a desktop computer, laptop, iPad, or a smartphone. Participants were given a two-week time period in October 2017 to

complete the survey. A follow up email was sent after the initial two weeks reminding teachers and principals to complete the survey and the importance of their participation.

Interview

The principals of the eight high schools that are selected using student FRPL data as the criteria will be contacted via email during the summer of 2017. I provided each principal with a written description of the study, potential benefits to the district, and a letter of consent to obtain permission for a face-to-face interview. Upon obtaining consent, principal interviews were scheduled at their school location. The interviews were no more than 30 minutes in length and were recorded using a digital recording device. Principals were provided with a copy of the eight open-ended interview questions and asked to respond. The interviewer provided examples to elicit more detailed responses. At the end of the interview, principals were provided with a twenty-dollar gift card as an incentive for their participation. The interviews were analyzed qualitatively by coding the data to determine themes, patterns or relationships. Once the interviews have been analyzed, principals will be sent a letter thanking them for their participation, a description of the generalizations and findings, and the possible impact to the district and teacher retention efforts.

Data Analysis

Instrumentation and Scaling. This study was designed to explore factors related to the retention of high school mathematics and science teachers using a mixed methods approach. Within this context, two strategies were used for collecting data from a purposive sample of educational professionals selected from a large suburban school district located in the mid-Atlantic region of the United States. The use of purposive sampling is vital when research objectives are narrowly specified to a point of restricting the range of subject

characteristics in order to yield meaningful data (Kish,1995). For this research problem, the focus was on workplace factors that influence decisions of mathematics and science teachers to remain in their current high schools or even with the district wherein the data were collected. Viewpoints and values that shape decision-making behaviors of this targeted sample of professionals are not well represented in the literature on teacher retention. The paucity of empirical evidence about retention of mathematics and science teachers gave credence to the use of both person-to-person interviews and sample surveys in this current study.

Survey techniques are ideal for gathering attitudinal data, yet certain types of items and formats cannot be applied when the research objective seeks to explore an area where limited empirical knowledge exists. Most survey instruments found in behavioral research contain closed-ended response items, where a subject is required to select one or more options from a finite list. There are many advantages to closed-ended items and self-completed, particularly with large samples. However, one dimension of this current study was to explore comprehensively the ideas of building principals, obtaining a more "layered" set of responses than possible with self-completed survey items. The uses of person-to-person interviews were, therefore, used to gather qualitative response data from principals of the eight high schools included in the research sample (see Appendix A).

The interview protocol or *interview schedule* consisted of eight items that were structured as open-ended questions or information seeking statements. Open-ended items have the advantages of soliciting answers to sensitive questions and facilitating probes to increase response breadth (Babbie, 1973; Selltiz, Wrightsman, & Cook, 1976). These items focused on academic preparation and experiences of the school leaders and viewpoints about

the work environment. Principals were given considerable flexibility in the length and depth of responses, as reflected in the broad scope of questions posed within the interview protocol.

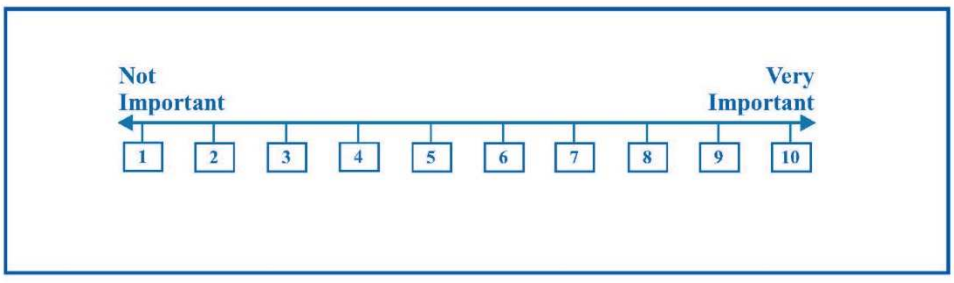
In certain instances, protocol item requested descriptions of or explanations about the school environment. Again, there were no parameters within which the responding principals were expected to offer their insights. Rather, the interview process sought to explore fully several critical factors about the working conditions that might influence a teacher's decision to remain within the school. No scoring or scaling methods were necessary for analyzing the interview data. Instead, thematic categories were generated from the response data and simple frequency representations associated each emergent category.

Contrasting the interview protocol, a self-completed survey was developed for the broader research sample of high school mathematics and science teachers. The survey instrument was developed for online completion by the teachers and others included in the research sample. The instrument consisted of 42 items structured into four sections (see Appendix A). All survey items were closed-ended, requiring a subject to select from predetermined categories. The first section consisted of 12 statements items focused instructional support. Each of these items contained two linked response scales that allowed subjects to rate their viewpoints on a 10-point Likert-type index. The first response scale addressed the statement's "*importance*," and the second response scale was focused on the "*principal's control level*." Second two of the survey followed the same format of the first section, with 12 statements focused on school leadership. Each of the 12 items in section two contained two linked response scales, seeking ratings of importance and principal's control.

The third section of the survey instrument also consisted of 12 statements, but there was only on response scale linked with each item. The 10-point response scales in section three sought only a rating of importance for each statement. Background information for each subject was sought from items in the fourth section of the survey instrument. These closed-ended items were focused on teaching experience, certification status, grade level currently teaching, current position, ethnic background, and gender.

Focusing again of the first three sections of the survey instrument, each of these sections contained 12 substantive statements with Likert-type response categories linked to each items. Using a conventional psychometric approach, each of items received a rating value of one to ten that represented a subject's level. Figure B presents a schematic representation of the six-point Likert response scale used for items in section one of the survey. As shown in the schematic, the strongest level of adherence to item content elicited a response of "*Agree*," which was assigned a value of ten. When the subject's viewpoint was diametrically opposed with a statement, the selection of "*Disagree*" was offered and a value of one assigned to that item. Eight intermediate response categories were possible for reflecting lesser levels of item agreement or disagreement. These ordinal-level item ratings were subsequently combined into a composite "*score*" to represent a subject's overall viewpoint for a given workplace factor. The psychometric appropriateness of this scoring method is supported in the literature on survey methods (Guilford, 1954; Thorndike, 1982; Kish, 1995).

Figure B Schematic representation of response scale for survey items


Not
Important
Very
Important
1
2
3
4
5
6
7
8
9
10

An internal consistency analysis was conducted for each of five scales derived from the Likert-type response items (Thurstone, 1925; Cronbach, 1951). Table 6 presents that results of the reliability analysis. For *Instructional Support–Importance* scale, a reliability coefficient of .92 was found for the 12 items comprising that particular scale. A coefficient of .91 was found for 12 items comprising the *Instructional Support–Principal's Control Level* scale. An even higher alpha coefficient was generated for the items of the *School Leadership–Importance*, with an attained reliability coefficient of .95. For the *School Leadership–Principal's Control Level***,** the highest reliability coefficient of .96 was attained. The lowest coefficients of .86 was calculated for the *Working Conditions* scale. Psychometric theory suggests that larger sample sizes with their increase variability will produced stronger item reliability coefficients. This lower coefficient is well within conventional level of strong measurement quality and would likely increase in magnitude with a larger sample size. The other four reliability coefficients for the survey are considered exceptionally strong for survey research data (Dressel, 1940; Tucker, 1946).

Table 6. Reliability Coefficients for School Resources and Working Condition Scales (N = 142)

Survey Scale	Number of items	Alpha Coefficient
Instructional Support–Importance	12	.92
Instructional Support–Principal's Control Level	12	.91
School Leadership–Importance	12	.95
School Leadership–Principal's Control Level	12	.96
Working Conditions	12	.86

A two-step procedure was used to generate summary scores for each scale of the survey instrument. As a first step, a mean value was generated for all items within a given

scale. For example, the *Working Conditions* scale consisted of 12 items and response values for any single item could range from one to ten points. Therefore, a mean response for this scale could be 8.56 for a given subject. This calculation transformed the ordinal level response values to a quasi-interval scale, with metric properties that allow for a broader scope analysis method to be applied (Tucker, 1946; Ferguson, 1951).

The second step in the scoring procedure involved multiplying the average response by ten to generate higher magnitude scale scores, with values ranging from 10 to 100 points. Using the above example, the mean response level of 8.56 would be transformed to a scale score of 85.6 for that particular subject. The computed scale scores maintain the descriptive characteristics of the original response data while enhancing score interpretability. Similar procedures are commonly used in converting raw score on standardized tests to summary scores for public consumption (Babbie, 1973; Johnson, 1977).

Analysis Approach

Data analysis for this investigation were performed in three phases, based on the mixed methods of data collection and the exploratory nature of research questions. The first phase of data analysis focused on interview response data, which were, of course, qualitative in structure. Responses from the eight sampled principals were electronically recorded by the interviewer and converted into printed transcription within a 24-hour period. After data verification by the interviewer, the printed transcriptions were forwarded to a psychometrics expert for data condensation and response coding.

As a next step, responses for interview questions were carefully reviewed and placed into substantive categories that represented logical themes. The objective of this analysis process was to minimize the number of response categories for any interview item without

losing any substantive meaning or nuanced expressions. This condensation process represents the primary objective for the first phase of data analysis, followed by the placement of each case (i.e., a principal) into one or more of the thematic categories (Babbie, 1973; Gorden, 1969; Kahn & Charles, 1967). No statistical tests were possible or necessary with these qualitative data. Instead, frequencies for each thematic category were then recorded and placed into tables that corresponded with specific research questions.

The second phase of analysis was focused on quantitative data generated from survey responses. Initially, descriptive statistics were generated to detail background characteristics of subjects selected for the research sample. These descriptive statistics included frequencies and percentages, augmented with graphic displays to reflect certain key characteristics used in subsequent group comparisons. Next, means and standard deviations were generated for individual items of each section of the survey. These means were used for ranking the intensity levels of response data in each area of the survey. As discussed earlier, substantive items within the survey each has a 10-point Likert-type response scale attached. Thus, higher means for any given item reflected greater response intensity and, of course, a higher rank for the item. Subsequently, items means, standard deviations, and ranks were placed into tables corresponding with specific research questions.

The third and final phase of data analysis consisted of relevant group comparisons, using significance tests. These statistical tests were performed on the overall scale scores described in the previous section. The test will be of a causal-comparative nature, seeking to highlight any salient differences within the sample the might reflect differences in attitudes and viewpoints regarding teacher retention (Nachmias & Nachmias, 2007; Franklin & Osborne, 1971). For binary comparisons, t-tests were used for exploring probability levels of

difference between defined subgroups. When statistical comparisons are required for three or more groups, the analysis of variance method was used. Findings from these significance tests were placed in tables in accordance with research question to which the results applied.

Human Subjects Research

This study was reviewed and approved by the University of Maryland's institutional review board and District B's Research and Evaluation review board to obtain approval for this study. All participants signed a consent form acknowledging their participation in the study. The consent form contained the title and purpose of the study, procedures, benefits, and confidentiality. For the principal survey and interviews, confidentiality for each principal is protected through the use of a pseudonym. Participants did not acknowledge any known risks for involvement in this study.

Questionnaire data was collected and stored through the Qualtrics website. Only the researcher has access to the data that was be collected to protect the privacy and anonymity of all survey respondents. The interview data was collected and analyzed by the researcher protecting the anonymity of the responses by the principals.

CHAPTER 3: ANALYSIS

The current study describes and explores perceptions of education professionals regarding the retention of mathematics and science high school teachers. A mixed-methods approach was used for gathering data for a sample of principals, teachers, and other professional selected from a large suburban school district in the mid-Atlantic region of the U.S. Self-completed surveys were administered to all subjects selected for the research sample. The survey was comprised mostly of Likert-type items that requiring subjects to provide intensity ratings on concepts about working conditions that influence teacher retention. Augmenting these survey data were person-to-person interviews conducted with the principals from each high school targeted in the research sample. Interview items were designed to gather layered and detailed perspective about the role of school leaders in the establishment of working conditions in high schools. The general goal of study was to understand the prominent factors associated with the retention of high school teachers, particularly those education professionals teaching mathematics and science classes.

This section presents results from analyses of data gathered from sampled principals, teachers, and other professionals, presenting findings regarding four research questions. Details of the sample characteristics are presented initially, followed by statistical analyses for each of the research questions. Descriptive analyses of the research sample include response frequencies, percentages, and graphic displays. Qualitative interview data are explored with descriptive methods. Significance tests, descriptive statistics, and graphic displays used to compare and explicate data gathered from the survey instrument.

Conclusions and implications are included to highlight the importance of key outcomes from the data analyses. These discussions help to summarize the meaningful

outcomes from the survey and interview data, providing suggestions for ways that school administration might work to retain mathematics and science teachers in high schools. The final presentation in this section focuses on future research approaches that might improve upon methods used in this current study and suggested topics for further studies on teacher retention.

Sample Characteristics

The fourth section of the survey instrument contained eight items designed to capture background information from the research sample. In review, the survey was distributed to a total of 246 subjects sampled from a large county school district located within the Mid-Atlantic region of the United States. The subjects were education professionals employed as full-time by the district. Most individuals selected for the study were high school mathematics and science teachers, yet there were also eight building principals and several other education professionals included in the sample. Surveys were administered individually to each sample of professionals during a three-week period of the fall quarter. The eight principals participated in a person-to- person interview process for augmenting the survey data with "*dense*" qualitative responses. All subjects participated in the study voluntarily and were given uniform guidelines for responding to survey or interview items. Confidentially and anonymity responses were guaranteed by the investigator through appropriate informed consent protocols.

For the interview portion of the study, responses were recorded electronically, then transcribed into printed documents. An online data-collection system was used for distributing the survey instrument to subjects individually, allowing each respondent to complete instrument at her or his own pace. Subjects were allowed to suspend their online

sessions at any time and to resume the process without loss of data. The online data collection system allowed for reviewing and changing responses, as desired. At the end of the three-week period, responses were entered into a structured file system for statistical analyses. A total of 176 subjects, 71% of the target group, participating in the survey. Yet, the final number of subjects included in the data analysis was 142 (or 58%) of the target group, as these education professionals actually completed the survey.

***T**able 7. Descriptive Profile for Working Conditions Survey Sample.*
(Note that table values reflect actual responses from sampled individuals.)

Table 7. Descriptive Profile for Working Conditions Survey Sample (N=142)

Category	Frequency	Percent	Cumulative Percent
Gender of Subject			
Female	79	58.5%	58.5%
Male	56	41.5%	100.0%
Position for Subject			
Principal	8	5.6%	5.6%
Teacher	144	93.0%	98.6%
Other	2	1.4%	100.0%
Subject's Ethnicity			
Asian	49	34.0%	34.0%
Black/African Am.	53	36.8%	70.8%
White	28	19.4%	90.3%
Other	14	9.7%	100.0%
Grade Level			
9th Grade	37	28.7%	28.7%
10th Grade	31	24.0%	52.7%
11th Grade	38	29.5%	82.2%
12th Grade	23	17.8%	100.0%

Table 7 shows a descriptive profile of the subject included in this study. Of those education professionals agreeing to participate in the study, 144 (93.0) were mathematics and science teachers, with 8 (5.6%) participants holding positions as principals and 2 (1.4%)

participants having other positions. Females comprised majority of the sample (79 or 58.5%), with male participants totaling 56 (41.4%). Regarding ethnicity, the largest group of participants was African American (49 or 36.8%), followed by Asian subjects (53 or 34.0%). Whites totaled 28 or 19.4% of the sample, with persons of "*other*" ethnic backgrounds constituting 14 or 9.7% of the analysis sample. For those subjects holding teaching positions at the time of data collection, 37 (28.7%) reported assignments to 9th grade classes and 31 (24.0%) were assigned to 10th grade classes. A total of 38 (29.5%) of the subject were assigned to 11th grade classes, with a final group of subjects, 23 or 17.8%, reporting assignment to 12th grade classes. Again, all teachers targeted for this research sample were mathematics and science educators, based on one of the primary objectives for this research.

Relative to years of teaching experience, 33 (53.6%) of the subjects indicated having 1- 10 years of total teaching experience, with 41 (43.8%) reporting 11-20 years of total teaching experience (refer to Table S-C). A frequency of 39 (31.2%) subjects reported having 21-30 years of total teaching experience, and 12 (9.6%) indicated having 31 or more years of total teaching experience. With respect to years of teaching in the target school district, the largest portion of sampled teachers (47 or 37.9%) reported having taught for 1-5 years in the district, with equal frequencies (29 or 23.4%) of teachers reporting having taught in the target school district for 11- 15 years and 16 years or more, respectively. A frequency of 19 (15.4%) indicated having taught in the target school district for 6-10 years.

Regarding years of teaching within their current school building, the highest response frequency (65 or 54.6%) was noted for those mathematics and science teachers reporting 1-5 years of experience in their current building. A frequency of 21 (17.7%) of teachers reported having been assigned to their current school building for 6-10 years, followed by 18 (15.1%)

of subjects indicating 16 or more years of teaching experience in their current building. As reflected in Table 8, the smallest portion of the sample (15 or 12.6%) indicated having 11-15 years of teaching experience in their current school building. Note again that all teachers selected for this study were assigned to teach mathematics and science courses.

Table 8. Teaching Experience for Working Conditions Survey Sample (N=142)

Category	Frequency	Percent	Cumulative Percent
Total Years of Teaching			
1-10 yrs.	33	26.4%	26.4%
11-20 yrs.	41	32.8%	59.2%
21-30 yrs.	39	31.2%	90.4%
31 o r more yrs.	12	9.6%	100.0%
Years Teaching in the District			
1-5 yrs.	47	37.9%	37.9%
6-10 yrs.	19	15.3%	53.2%
11-15 yrs.	29	23.4%	76.6%
16 or more yrs.	29	23.4%	100.0%
Years Teaching in Current School			
1-5 yrs.	65	54.6%	54.6%
6-10 yrs.	21	17.7%	72.3%
11-15 yrs.	15	12.6%	84.9%
16 or more yrs.	18	15.1%	100.0%

Analyses for Research Question 1

The study was focused on workplace conditions and the influences of these conditions on teacher retention, particularly for those education professionals whom teach mathematics and science classes in high school. As discussed earlier, the research sample included principals, teachers, and other education professionals, all of whom responded to a self-completed survey consisting of several scaled items. Responses to the survey provide quantitative data for the study. Further, principals in the sample also participated in person-to-person interviews for capturing qualitative data for addressing research questions.

In this segment, both data sources are used to explore the research question stated as: *What importance do high school mathematics and science teachers place on various instructional support and school leadership factors as an influence on working conditions, and what is the perceived control level of school principals on these instructional support and school leadership factors?* Descriptive approaches were used to analyze the survey and interview data pertaining to Research Question 1. Results from the survey analysis will be discussed first herein, followed by a review of findings from the interviews conducted with school principals.

Survey Analysis for Research Question 1

A series of Likert-type items that were used in the survey and each of these items contained a ten-point response scale. Presented earlier was a discussion of the psychometric appropriateness of this scaling approach for measuring attitudes and viewpoints. For exploring Research Question 1, means and other descriptive statistics were generated for each of 12 items relating to instructional support factors that influence teacher retention in high school. A ranking process was used to determine which of the 12 areas appeared to be

of the greatest importance relative to *instructional support*. Note that higher item means reflected a greater viewpoint of importance by subjects participating in the survey. Consider, as well, that school principals were excluded from this ranking process, since one dimension of the analysis would have resulted in an inappropriate self-ranking process. The five items receiving highest ranks based on mean "*importance*" ratings are presented in Table 9.

Table 9. Top Five Ranked "Instructional Support" Responses Based on Subject's Perception of the "Importance" (N = 134)

Survey Item	Rank	Item Data	
		Mean	σ
"Teachers have sufficient access to appropriate instructional materials."	1st	9.00	1.61
"Teachers have access to reliable communication technology (e.g. phones, faxes, email, etc.)."	2nd	8.93	1.58
"The physical environment of classrooms in this school supports teaching and learning."	3rd	8.92	1.60
"Teachers are encouraged to try new things to improve instruction."	4th	8.89	1.43
"Teachers have sufficient access to instructional technology (e.g. hardware, software, etc.)."	5th	8.78	1.80

The survey item attaining the highest rank subjects was *"Teachers have sufficient access to appropriate instructional materials."* The mean rating for this item was $X = 9.00$ and standard deviation of $\sigma = 1.61$, based on responses from 134 subjects. Second ranked was the survey item "*Teachers have access to reliable communication technology (e.g., phones, faxes, email, etc.)*," with a mean rating of $X = 8.93$ ($\sigma = 1.58$), followed by *"The physical*

environment of classrooms in this school supports teaching and learning" with a mean rating of $X = 8.92$ ($\sigma = 1.60$). Ranked fourth highest among subjects in the survey was the item *"Teachers are encouraged to try new things to improve instruction*," attaining a mean rating of $X = 8.89$ ($\sigma = 1.43$). The fifth highest ranking was found for item "*Teachers have sufficient access to instructional technology (e.g., hardware, software, etc.)*," which had a mean rating of $X = 8.89$ ($\sigma = 1.43$) among subjects in the study.

Table 10. Top Five Ranked "Instructional Support" Responses Based on Subject's Perception of the "Principal's Control" (N = 134)

Survey Item	Rank	Item Data	
		Mean	σ
"The school environment is clean and well maintained."	1st	8.43	1.73
"Professional development is data driven and structured to refine teaching practices."	2nd	8.01	1.99
"Teachers are encouraged to try new things to improve instruction."	3rd	7.89	1.95
"Teachers have sufficient access to office equipment and supplies (e.g., copy machines, paper, pens, etc.)."	4th	7.75	2.07
"Sufficient resources are available for professional development in my school."	5th	7.74	2.08

A parallel ranking process was used to determine which of 12 areas of *instructional support* were perceived to be most controlled by the building principal. The five items receiving highest ranks based on mean *'principal's control level*' ratings are presented in Table 10. As shown in the table, the item "The school environment is clean and well maintained," with a mean rating of X = 8.43 ($\sigma = 1.73$) among the 134 responding subjects.

Ranked second in this section of the survey was the item *Professional Development* is data driven and structured to refine teaching practices, based on a mean rating of X=8.01 (σ = 1.99). Ranked third among subjects as "Teachers are encouraged to try new things to improve instruction" with a mean of X = 7.89 (σ = 1.95), followed by item *"Teachers have sufficient access to office equipment and supplies (e.g. copy machines, paper, pens, etc.),"* with a mean rating of X = 7.75 (σ = 2.07). The fifth highest rating was found for item *"Sufficient resources are available for professional development in my school,"* which had an attained mean of X = 7.74 (σ = 2.08).

Table 11. Top Five Ranked "School Leadership" Responses Based on Subject's Perception of the "Importance" (N = 134)

Survey Item	Rank	Item Data	
		Mean	σ
"Teachers are held to high professional standards for delivering instruction."	1st	9.17	1.36
"Teacher performance is assessed objectively."	2nd	8.89	1.76
"Teachers receive feedback that can help them improve instructional effectiveness."	3rd	8.88	1.79
"The procedures for teacher evaluation are consistent."	4th	8.83	1.71
"The faculty and leadership have a shared vision."	5th	8.77	1.66

Addressing the concept of *school leadership,* a ranking process was used to determine which of 12 areas appeared to the greatest importance by sampled high school mathematics and science teachers. Using the same approach as the previous analysis, the five items receiving highest ranks based on mean "*importance*" ratings are presented in Table 10. As presented in the table, a highest mean rating value was found for the item *"Teachers are held*

to high professional standards for delivering instruction," with a mean rating of $\bar{X} = 9.17$(σ =1.36) among the 134 subjects. Ranked second in this analysis was the item "*Teacher performance is assessed objectively*," with a mean rating of $\bar{X} = 8.89$ ($\sigma = 1.76$), followed by item "*Teachers receive feedback that an help them improve instructional effectiveness*," which *teacher evaluation are consistent*," with a mean rating of $\bar{X} = 8.83$ ($\sigma = 1.71$), and the fifth ranked item was "*The faculty and leadership have a shared vision*," with a mean rating of $\bar{X}$ = 8.77 ($\sigma = 1.66$).

Table 12. Top Five Ranked "School Leadership" Responses Based on Subject's Perception of the "Principal's Control" (N = 134).

Survey Item	Rank	Item Data	
		Mean	σ
"The faculty are recognized for their accomplishments."	1st	8.30	1.98
"Teacher performance is assessed objectively."	2nd	8.28	1.93
"Teachers are held to high professional standards for delivering instruction."	3rd	8.18	2.00
"The procedures for teacher evaluation are consistent."	4th	8.09	1.94
"Teachers receive feedback that can help them improve instructional effectiveness."	5th	8.09	1.96

Following the same analysis approach as discussed previously, the school leadership concept was rated by subject relative to perceptions of the building principal's actual control over factors in the workplace. Table 12 presents the results of this ranking process for the same 12 areas as those in the above discussion. As shown in the table, *"The faculty are*

recognized for their accomplishments" item was ranked highest in this phase of the analysis, with a mean rating of $X = 8.30$ ($\sigma = 1.98$). Second in this ranking process was the item *"Teacher performance is assessed objectively,"* attaining a mean rating of $X = 8.28$ ($\sigma = 1.93$). The third ranked item was *"Teachers are held to high professional standards for delivering instruction,"* with a mean rating of $X = 8.18$ ($\sigma = 2.00$). The fourth and fifth ranked items were *"The procedures for teacher evaluation are consistent"* with a mean of $X = 8.09$ ($\sigma = 1.94$) and *"Teachers receive feedback that can help them improve instructional effectiveness,"* attaining a mean of $X = 8.03$ ($\sigma = 1.96$).

Interview Analysis for Research Question 1

Person-to-person interviews were conducted with the principals from each of the eight high schools include in the research sample. A set of open-ended questions were posed to these education professionals, resulting in a comprehensive set of quantitative data that augment the more delimited survey responses. As described in Section II, questions were posed to each interviewee and the responses were carefully recorded then subsequently transcribed for analysis. Responses were subsequently condensed and summarized into thematic categories reflecting salient viewpoints and perspectives of the interviewed school principals. Table A provides a summary of the thematic categories derived from responses to the *"principal's influence"* aspect of Research Question 1. Each interviewee was systematically identified by rank of their Free and Reduced Price Lunch population from smallest to largest. The identification method allows for subjects within the research sample

to be referenced without compromising the anonymity of any particular subject. For any research process confidentiality and anonymity are necessary.

Table 13. Summary of Interview Responses for the 'Principal's Influence 'Aspect of Question 1 and the Principals Associated with each Response Exemplar

Theme	Response Exemplar	Principals Associated
Building Climate	*"…I support the teachers and provide a collaborative working environment for the staff; this positive climate in the building is created by my leadership…"*	HSP 3, HSP 5, HSP 8
Transparency	*"… Transparency is the key to establishing a good work environment; open and honest communications let teachers know they are performing…"*	HSP 1
Administrative Support	*"… As a school leader, I create a safe and clean working environment; we focus on classroom management; professional development, and positive interactions…"*	HSP 2
Relationship Building	*"… Building strong relationships with the teaching staff is my greatest source of influence; this process leads to a work environment that in inviting and inclusive…"*	HSP 7
Instructional Support	*"… I influence the space allocations, access to human resources for improving instruction, professional development, and new teacher training; these things create a good work environment…"*	HSP 6
Communication	*"… The 'rolling staff meetings' that I have implemented in my building allow the teachers to participate in the planning process; this is my greatest influence and it seems to create a positive work environment…"*	HSP 4

As seen in Table 13, a set of six thematic categories emerged from responses given by the interviewed principals. These categories reflect unique response patterns, yet there was

some minimal degree of overlap in substance for the six emergent themes. Identifying response categories with the strongest clustering of cases is a useful approach for summarizing qualitative data (Babbie, 1973; Selltiz, Wrightman, & Cook, 1976). Response category 1 contained the largest cluster of cases, with three sampled school principals stating "*...I support the teachers and provide a collaborative working environment for the staff; this positive climate in the building is created by my leadership...*" The other response categories in Table 13 had a single principal offering a unique perspective regarding her or his influence on the working conditions within the school. Two responses focused on the physical environment, reflected in the statements: "*...As school leader, I create a safe and clean working environment...*" and "*...I influence the space allocations, access to human resources...*" In contrast, the remaining three singular responses focused on relationships with the teaching staff, as reflected in the comments of: "*...Open and honest communications let teachers know how they are performing...*," "*...The 'rolling staff meetings' that I have implemented in my building allow the teachers to participate in the planning process...*," and "*...Building strong relationships with the teaching staff is my greatest source of influence...*"

Table 14. Summary of Interview Responses for the 'Principal's Non-Influence' Aspect of Question 1 and the Principals Associated with each Response Exemplar

Theme	Response Exemplar	Principals Associated
Facilities	*"... I have no influence over the physical plant, including the heating and cooling; the building is old and falling into disrepair; this causes morale and health problems with the teachers, which could cause attrition ..."*	HSP 2, HSP 8, HSP 1, HSP 3
Building Climate	*"... I have no control over class sizes, which places too much work on teachers at times; our enrollment levels have increased, exceeding building capacity; these conditions could make teachers leave..."*	HSP 5, HSP 4
Instructional Support	*"... As principal, I have no influence over surrounding curricular initiatives; this limits my ability to structure procedures that provide the best instruction for the students; it might lead to teacher attrition ..."*	HSP 5
Communication	*" ... I cannot control the public perceptions of the school, which is often a negative factor; these perceptions make the work environment less attractive for the teaching staff and might cause some to leave ..."*	HSP 8
Community Involvement	*" ... Parent involvement is a problem that I do not have any positive control over; I would like to increase the level of participation of parents in decision-making and planning, thus improving work conditions ..."*	HSP 6
Professional Development	*"... There is no influence by me over the level of pre- service experiences for the teaching staff; this results in uneven skills and performance levels for the staff; some of the better teachers could leave as a result ..."*	HSP 7

Table 14 also contains a set of five thematic categories that emerged from the principal interviews, yet the focus of these responses was areas of " *non-influence*." The

largest cluster of cases was associated with the representative response of "*...I have no influence over the physical plant, including the heating and cooling; the building is old and falling into disrepair; this causes morale and health problems with the teachers, which could cause attrition...*" Four of the sampled principals offered this response. Only one other category in Table 14 consisted of more than a single interviewee. Specifically, category two contained a cluster of two principals who offered the representative response of: "*...I have no control over class sizes, which places too much work on teachers at times; our enrollment levels have increased, exceeding building capacity; these conditions could make teachers leave...*"

Other responses presented in Table 14 were singular in nature, reflecting views that principal had limited of no influence over certain factors that shape working conditions. These singular responses included "*...As principal, I have no influence over surrounding curricular initiatives; this limits my ability to structure procedures that provide the best instruction for the students...*" and "*...There is no influence by me over the level of pre-service experiences for the teaching staff; this results in uneven skills and performance levels for the staff...*" Both of the responses were focused on pedagogical concerns, yet the two other response addressed more external concerns. One principal indicated that "*... Parent involvement is a problem that I do not have any positive control over; I would like to increase the level of participation of parents...,"* while the other remaining principal suggested that "*...I cannot control the public perceptions of the school, which is often a negative factor; these perceptions make the work environment less attractive for the teaching staff..."*

Research Question 1 Summary

Findings from the survey and interview analyses provided important insights regarding working conditions that might influence the retention of teacher in high school for the targeted school district. The mathematics and science teachers responding to the survey ranked highly those factors in the workplace that supported instructional activities. Instructional materials, technology in the classroom, and other pedagogical matters were given high prominence in survey responses. Even when viewing the control of school principals in educational matters, the focus of teachers was centered on instructional factors when offering survey response. A well-maintained school environment emerged as an area where principals are perceived to have control, along other resource areas the directly support instruction. Even professional development activities were identified as a key area where principals controlled the process. Again, the responding mathematics and science teachers were focused mainly on pedagogical matters.

In something of a contrast, principals viewed their influence on working conditions as more logistical and, of course, managerial. Moreover, there were areas of high importance identified by the teachers where principals viewed themselves as having limited control. The most salient theme evidenced by the interviewed principals was that of support and collaboration. Other staff relationship matters were noted as being within the control of the principal, yet the overall theme of open communications and staff participation in the leadership process as the most prominent response.

Regarding areas where principals seemed less influential, the school building itself was not perceived to be a component of working conditions where the interviewees appeared to have control. Also, there were reservations expressed about the ability to control class size,

work space allocations, and enrollment levels. These areas, while potentially critical to teaching effectiveness, were expressed as not being within the purview of a school leader's influence. Certain factors outside the school, including public perception and parent involvement, were equally viewed as challenging for principals to control. Responses were, of course, driven by the interview protocol, yet the prevailing findings in this phase of the analysis was that principals were able to offer some meaningful supports for the teaching process, but there were limits to the influences of these building leaders on working conditions.

Analyses for Research Question 2

Research Question 2 was focused somewhat more precisely on the components of the school environment that have influenced a mathematics or science teacher's decision to remain within the target school district. Examples of these components are class size, facilities, and job security. The research question was specifically stated as: *What specific working conditions do high school mathematics and science teachers report as influencing their decisions to remain in the school district, and what is the perceived control level of school principals on the working conditions?*

Three iterations of coding were employed to address Research Question 2. The initial, first-level coding process was descriptive in nature and identified general categories that are prevalent in the participants' responses. The next level of coding involved condensation to find common groupings and employs the first level of interpretive coding. The third and final level of coding identified potent themes, important implications, and other revelations that uniquely address the research question. Level 3 codes were eventually linked to other Level 3

codes within and across transcripts and became an important means by which the researcher defined themes within and across data sets.

Table 15. Top Five Ranked "Working Condition" Responses Based on Subject's Perception of the "Importance" (N = 134)

Survey Item	Rank	Item Data	
		Mean	σ
"Teaching assignment (class size, subject, student demographics, etc.)."	1st	9.16	1.44
" Support from school administration."	2nd	9.15	1.35
"The quality of school leadership."	3rd	9.10	1.42
"Job security and benefits."	4th	8.99	1.43
"Effectiveness with the students I teach."	5th	8.96	1.45

Survey Analysis for Research Question 2

Presented in Table S15 are the five highest ranked items reflecting working conditions in the school. Based on the 10-point Likert-type scale, each subject provided an item rating and the mean rating was used for determining perceived importance. The survey item attaining the highest rank in this analysis was *"Teaching assignment (class size, subject, student demographics, etc.),*" with a mean rating for this item of $X = 9.16$ and a standard deviation of $\sigma = 1.44$. Closely following relative to the subjects' ratings was the item: "Support from school administration," which ranked second in the analysis with a mean of X

= 9.15 (σ = 1.35). Third in the ranking was the item, "The quality of school leadership," with a mean rating of X = 9.10 (σ = 1.42), followed by the item, "Job security and benefits," attaining a mean rating of X = 8.99 (σ = 1.43). The fifth ranked item was: "Effectiveness with the students I teach," with a mean rating of X = 8.96 (σ = 1.45).

Interview Analysis for Research Question 2

Data from the person-to-person interviews were used to address Research Question 2, augmenting the findings from survey responses. In review, the principals from each of the eight high schools included in the research sample were interviewed to obtain their viewpoints regarding factors more important for keeping teachers in their schools and employed within the school district. As described earlier, the interview responses were condensed into representative responses that established the emergent themes. Table 16 contains a summary of the emergent themes regarding working conditions derived from responses. The frequency of cases associated with the themes are also presented in the table.

Table 16. Emergent Theme for Research Question 2 and Frequencies

#	Emergent Themes	Frequencies	
		Sources	References
1	Principals Can't Control Facilities	4	6
2	Professional Development and Support	8	21
3	Awareness of Strengths	5	6
4	Retention Influenced by Demographics and Achievement	6	10

An analysis of the interview data revealed that principals typically agreed that the school facilities were an important aspect of teacher's working conditions that they could not

control. While discussing the facilities, some principals mentioned the financial limitations as an obstacle for addressing some the current issues with their school building. Additionally, school administrators also discussed themes associated with Professional Development and Support, Awareness of Strengths, and Retention Influenced by Demographics and Achievement. For example, the following quotes are evidence of these emergent themes.

Principals Can't Control Facilities

"Gotcha, alright, so let's start with class sizes. Having adequate class sizes, trying to make sure that we build a master schedule and staff our school in such a way that we're not putting more than 35, 36 students in classes. Specifically, our subject areas, along with working conditions, addressing student behavior, and then just the overall facilities. Everything from the AC units to the heating. They can be as trivial as bugs in classrooms and mice and rodents and things like that, make sure that that's kept to a minimum." – HS 3 Principal

"Facilities, being in an older school building, there's parts of this building where whether it's the AC and heating units. Part of it won't be resolved until we get a new building or if there's a new building. That's definitely one area that I think is outside of my purview of a principal because of the financial load with that. I think everything else I have a pretty solid voice in. I think perception, even though that may not be directly connected to this question, I think perception has something to do with how people develop biases to believe that they're supportive and I think that that kind of takes time for people to get in here, for them to get a chance to really see what happens." – HSP 3 Principal

"I would definitely say the conditions of your physical plant, your access to human resources, instructional resources that also support their ability to facilitate quality instruction as well as their own teacher growth and development… So I would say this physical plant that's really in bad shape. And what we hear is because HS 8 was slated to be ... We were slated to receive a new school that has now been pushed all the way back to '25 even before they break ground, things just continue to deteriorate but the District is reluctant to spend money to fix things because again, they're thinking in the next few years they're gonna start on the new school." – HSP 8 Principal

"An area I know I have no influence, unfortunately is facilities. It has to do with my building and the operations of the facilities in the building. Prime example is the temperature in my building. I have no control over how cold or hot it is in my building, which has impacted the health and motivation of my teachers. And so, despite the positive affirmations, trying to boost morale in that area, I just can't control it. We just have to bear it, including myself. We just have bear it." – HSP 2 Principal

Professional Development and Support

"I would also say we put a great focus this year on our new teacher training program and that's as a result. We had approximately 38 teachers that left, primarily because they left the profession or they left the state. So we really, really wanted to focus on teacher retention and teacher development so all of those who came in new or new to the building they received support from our in-house mentor teachers which we have two. One who primarily deals without ESOL teachers or teachers with strong ESOL populations and then we have a Gen Ed mentor. So the combination of the support that they provide along with OTD along

with those teachers that are involved with TFA, our new and new to the building teachers receive a plethora of support from all different staff and support systems. So that's been a good thing." – HSP 8 Principal

"Well I think consciously I'm always trying to show teachers that I'm supporting them in what they do. And we want to make sure that all administrators, with all their leadership teams that we have, are demonstrating the same thing. It's not just me on a daily basis, but the leadership teams. And that they are supporting teachers in what they need, and listening. So in that way, we're just showing it every day that we want you to be here, we want you to know that you can count on us. People leave for "00 reasons, and I can't fight that. But we want to make sure they're not leaving because something we did not support them in." – HSP 4 Principal

"So when I do let them know, is there anything I can support them with, because they're been ill or they are struggling with taking care of a family member. And the fact that I will allow them to leave early, without having to take leave, shows them that I care. And they return because of these caring gestures. That's why they like and want to stay here. So, just taking a personal interest in them and recognizing and celebrating them, those are deliberate actions. I make time to deliberately do those things, because I know it matters." – HSP 3 Principal

Awareness of Strengths

"Strategic, input, responsibility, learner. If I lean on that and look at my compass points of east and north. My east, I see the vision, I see the picture. I think that is a huge strength of mine. I see where all the dots are connected, which also leads into my strategic. I believe that I'm very strategic about the setup of planning different pieces of why people should work with different people. I can see their strengths and areas of need and how to pair them together. But I think that that same strength sometimes falls into an area of need as well, because I am working on my clarity and ensuring that even though I can see where people's strengths and areas of needs are, I still don't recognize where I need to differentiate for people." – HSP 7 Principal

"*As far as my strengths, I think that I'm a pretty good communicator. I think I am pretty good at problem solving and kind of setting the big picture, even though my compass point is west, meaning they tell me I'm into details, but I think I can give direction of where we're going. I think a weakness or area of need is knowing when to say no and being persistent with that, and just right now staying on top of all the different initiatives rather systemic and then staying on top of just what common core limitation looks like."* – HSP 3 Principal

"My strengths are: I am a relater. I am a people person. I look at the person. I can determine what their strengths and weaknesses are, and I can use that information to achieve a goal. I am task oriented, which allows me to get things done and I know how to bring people in, so we can get things done. My areas of need, I would say, I need to not hold

everyone at the high standard of accomplishing a task at the same rate that I do, because I know there's something to be done and I work to get it done. I have to remember that not everyone has that same strength. So, just staying focused on what their strengths are, and not make my strengths become the expectation I have for them." – HSP 2 Principal

Retention Influenced by Demographics and Achievement

When asked do you think student achievement data impacts student retention in your school…

"Absolutely. So if a teacher is uncomfortable…Absolutely, if a teacher is sort of uncomfortable in regards to the population that they work with or feel that they have challenges around their ability to help them be successful, they're also concerned about their data and the kind of educator they are if they are not able to amass the kinds of numbers they want on some of these high stakes exams. And unfortunately when you look at the systemic data, it does not disaggregate and say "this data is low because it sort of highlights a specific population". So because we are all evaluated based on the same standards, many teachers don't want to be lumped into the same category with traditional English speaking Gen Ed students." – HSP 8 Principal

"I think that teachers can see their efforts. And if they can see that that's on our way to success, that their efforts are wielding. Coming out and they can see the impact of what they're doing, and then they can start looking at okay, how do we make this grow even more? So our students, or our teachers really take pride in that. I look at our AP teachers here, or their students. They all flew in the summer, but they come in to a building the day the AP

scores come out. They all in there trying to get those scores, they want to know what it is, and they want to see now, start planning for what's the next step. So they take pride in all of that, so very good." – HSP 4 Principal

"Absolutely. Absolutely, HS 1 is one of the high schools where teachers do remain for years and years and years. Because they see how well equipped the scholars come to high school. We don't have a lot of disciplinary problems. What we're dealing with are what we call trying to move the needle. Trying to move our scholars from being good to great. So, retention at HS 1 is not an issue due to the student success." – HSP 1 Principal

"Yes, because everybody wants to work at a school that's thriving, in which students are making gains. Everybody wants to see the fruit of their labor. Yes, I do believe that. I do believe that teachers see the kids excelling and grasping on, that they will want to stay because they see their investment into the community as well." – HSP 6 Principal

Research Question 2 Summary

The results of data analysis for the survey and interview responses were useful in highlighting several key factors of working conditions in sampled high schools. Survey responses for mathematics and sciences teachers suggest that both logistical and substantive factors influenced their decision to remain in the positions. Class size and student demographics were highlighted by the subjects, as well as support from the school administration. These factors were ranked even higher by the subjects than job security and benefits associated with their teaching positions.

Principals mostly identified facilities as an area in which they had the least control in terms of enhancing working conditions for teachers. In addition to mentioning facilities as an area in which they had little control, some principals attributed this lack of control to the financial limitations of the district to respond to ailing school buildings.

Analyses for Research Question 3

In review, Research Question 3 was structured to explore difference within the sample relative to viewpoint about working conditions and related factors influencing the decisions of education professionals to remain in their schools. While the first two research questions focused on the sample as whole, this question sought to address variations within the sample that might further explicate issues of teacher retention. The question was focused somewhat more precisely on the components of the school environment that have influenced a mathematics or science teacher's decision to remain within the target school district. Examples of these components are class size, facilities, and job security. Research Question 3 was specifically stated as: *Does the influence of working conditions differ among high school mathematics and science teachers based on teaching experience and other background characteristics?* The fourth section of the questionnaire used in the data collection process consisted of eight items that captured information about a subject's background. As discussed earlier in this section, these background items determined gender, ethnicity, years of teaching experience, certification status, current position, and grade level currently being taught.

The analysis strategy used to answer Research Question 3 involved conducting significance tests to determine if any group differences existed within the sample beyond the level of chance probability. Structurally, the background characteristics served as independent

variables in the tests, while scores generated from the five working condition scales served as dependent variables. Detailed in Section II, these scales all consisted of 12 items and had reliability coefficients of .86 or higher. The possible score range for each scale was 10 to 100 points, with higher values indicating greater agreement about the "*importance*" or the "*principal's control level*" for a condition in the workplace. Although significance tests were conducted with all eight background characteristics serving as independent variables, only two such variables yielded significant results–gender and ethnicity. More specifically, recordings were completed for each experience variable to create a dichotomy for t-test analyses and none of the other outcomes proved to be statistically significant. Therefore, the non-significant findings for years of experience and other variables were omitted and the more meaningful outcomes were discussed. Note that only teachers from the research sample were included in this phase of the data analysis.

Table 17. Top Five Ranked "Working Condition" Responses Based on Subject's Perception of the "Importance" (N = 134)

Survey Item	Rank	Item Data	
		Mean	σ
"Teaching assignment (class size, subject, student demographics, etc.)."	1st	9.16	1.44
" Support from school administration."	2nd	9.15	1.35
"The quality of school leadership."	3rd	9.10	1.42
"Job security and benefits."	4th	8.99	1.43
"Effectiveness with the students I teach."	5th	8.96	1.45

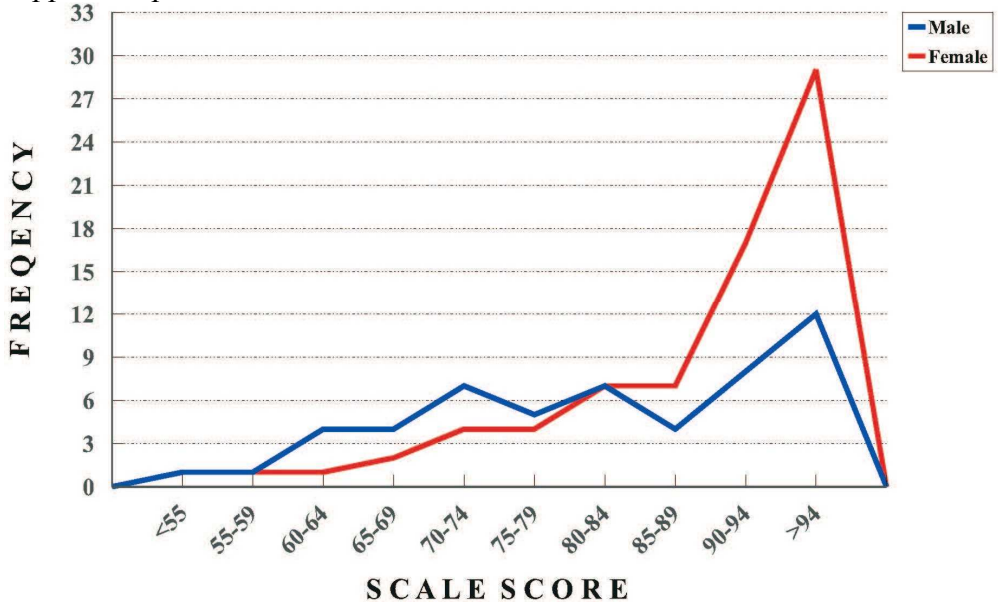
Comparisons of Gender Groups: Presented in Table 18 are results of t-tests conducted on the five working condition scales, using subject's gender as the independent variable. A significant *t-ratio* = -3.23 ($p < .01$) was found for the two-group comparison for *Instructional Support – Importance scale scores.* A higher mean score of X = 89.70 (σ = 11.15) was attained by the females in the analysis, and the male subjects attained a mean score of X = 82.42 (σ = 14.96). Thus, there was a difference of 7.2 points between the means for the two groups included in the comparison, again with female teachers rating the importance of instructional support significantly higher than their male counterparts. Figure B presents a frequency polygon of mean scores for the female and male teachers on the Instructional Support-Important scale. Both score distributions are distinctly skewed in the negative direction, yet the female trend line is more dramatically skewed. That is, more of the females attained scores on the high end of the scale, with a higher cluster of females falling in the 95 point of greater score range. Again, this graph shows the difference in intensity level between the two gender groups.

Table 18. Results of t-Tests on School Resources and Working Condition Survey Scale Scores by Gender Group (N = 134)

Survey Scale	Gender of Subject				
	Female (n=78)		Male (n=56)		t-Ratio
	Mean	σ	Mean	σ	
Instructional Support - Importance	89.70	11.15	82.42	14.96	-3.23

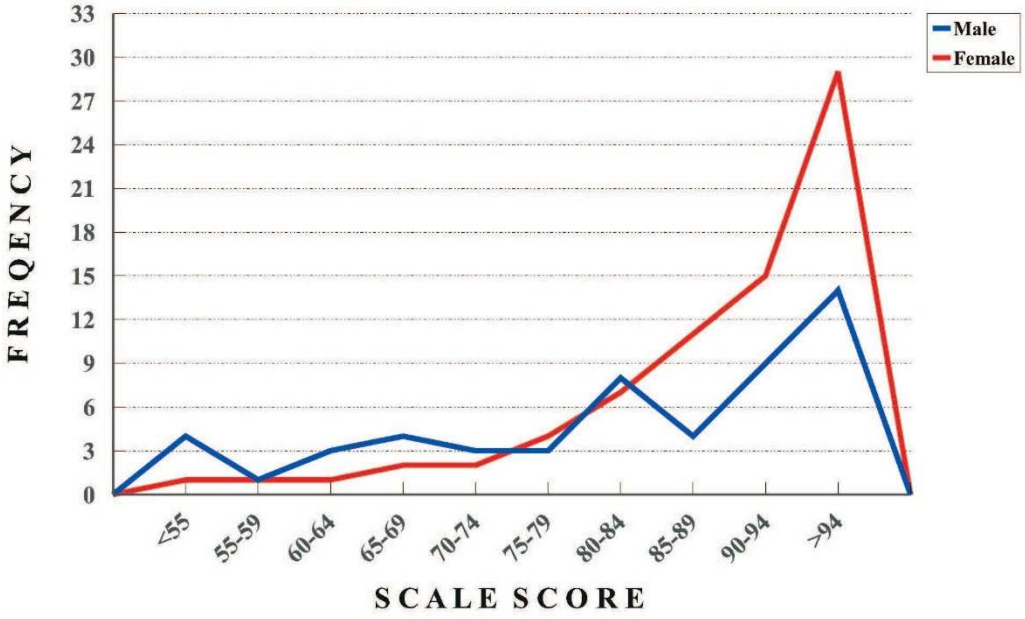
Survey Scale	Gender of Subject				
	Female (n=78)		Male (n=56)		t-Ratio
	Mean	σ	Mean	σ	
Instructional Support – Principal's Control	78.10	14.62	74.51	15.91	-1.34
School Leadership – Importance	89.83	11.75	82.27	17.30	-3.01
School Leadership – Principal's Control	82.56	15.36	77.23	17.23	-1.70
Working Conditions	89.03	9.99	86.33	11.78	-1.43

Figure C. Frequency Polygon of Mean Scores for Females and Males on the "Instructional Support–Importance" Scale



As shown in Table S-1, the comparison of female and male teachers on the School Leadership-Importance scale yielded a statistically significant result, with the t-ratio = -3.01 ($p<.01$). Female teachers attained a mean scale score of X = 89.83 (σ = 11.75), and their male counterparts attained a lower mean score of X = 82.27 (σ = 17.30). The difference between these two groups means was 7.56 points, with female teachers rating the importance of school significantly higher than males. Figure C presents a frequency polygon of mean scores for females and males on the School Leadership–Importance scale. In this instance, both score distribution were negatively skewed, with more females teachers clustered in the score range of 85 to 100 points. This pattern suggests that female teachers were more intense in their viewpoints that school leadership was a key factor in creating a positive work environment within high schools.

Figure E. Frequency Polygon of Mean Scores for Females and Males on the "Support Leadership–Importance" Scale



Comparisons of Ethnic Groups: To facilitate the analysis of ethnic characteristics, it was necessary to recode the original data for creating viable comparison groups within the sample. Shown earlier in Table 7, six ethnic groups were identified in the survey data based on response provided by subjects. There was only one subject reporting an ethnic background of "*Native Hawaiian/Pacific Islander*" and four subjects reported ethnic background of "*Hispanic/Latino*." As shown in Figure E, these five subjects were combined into the category defined as "*Other*" to create a larger group for a more statistically viable comparison using the analysis of variance test. The resulting recoded group consisted of 14 subjects or 6.3% of the research sample.

Figure F. Recoding of ethnicity data for significance testing

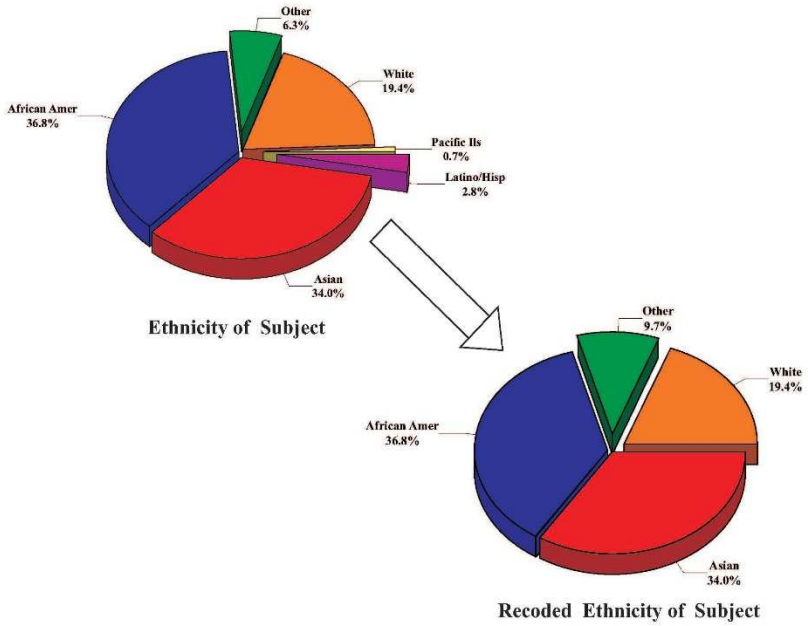


Table 19 shows the result of a comparison of teachers in the research sample, based on ethnic background. The comparison was accomplished with the analysis of variance technique applied to the four ethnic groups resulting from the recoding process previously described. As seen in the table, there was a significant F-ratio = 5.11 ($p<.05$), attained in the comparison of recoded ethnic groups for the School Leadership-Importance scale. The highest mean score in this comparison was found for the Black/African American group (X = 89.88; σ= 10.99), followed by the mean for the Asian group (X = 87.72 σ= 13.51). Lower mean scores were found for the White group (X = 79.38; σ= 18.73) and the Others' group (X = 81.59; σ= 17.95). The largest difference between group means was noted for Black/African American group contrasted with the White group. This difference of 10.5 points contributed most to the significant *F-ratio* in this comparative analysis.

Table 19. Summary of Analysis of Variance on School Resources and Working Condition Survey by Ethnicity of Subject (N = 143)

	Ethnicity of Subject								
	Asian		Black/AA		White		Other		
Survey Scale	X	σ	X	σ	X	σ	X	σ	F-ratio
Instructional Support – Importance	88.17	12.15	87.01	13.16	82.45	12.72	82.57	21.01	1.77
Instructional Support – Principal's Control	78.95	15.65	75.19	16.23	73.47	14.55	75.83	14.21	1.74
School Leadership - Importance	87.72	13.51	89.88	10.99	79.38	18.73	81.59	17.95	5.11*
School Leadership – Principal's Control	81.09	15.88	81.55	17.86	75.07	17.73	79.04	16.62	1.63
Working Conditions	89.95	11.90	89.75	10.92	83.07	9.57	82.96	7.14	4.07**

Figure G contains a frequency polygon of mean scores for ethnic groups based on *School Leadership–Importance* scale scores. A shown in the graph, scores for African American subjects were negatively skewed, with a high percentage of teachers clustered in the 85 to 100 points range. This score pattern was also found for Asian teacher in the comparative analysis of scale scores. In contrast, the score pattern for White teachers in Figure G is more flat than those of African Americans and Asians, with a moderate clustering

of scores on the high end of the distribution. Similarly, the Other group had a flatter distribution shape, moderate score clustering toward the upper score range. This pattern suggest that African Americans and Asians were more intense in their viewpoints regarding the importance of school leadership for creating a positive working environment in their high schools.

A significant F-Ratio was also shown in the Table 19 for the "Working Conditions" scale. In this comparison of recoded ethnic groups, a significant test value of F-ratio = 4.07 ($p<.05$) was found. Asian teachers attained a mean scale score of ($X = 89.95$; $\sigma = 11.90$), which was highest in the analysis. The mean score for African Americans, ($X = 89.75$; $\sigma = 10.92$), was very close in magnitude to that of Asians in this ethnic group comparison. The respective mean scale scores for White teachers and those defined as Other were found to be lower in comparison. White teachers attained a means scale score of ($X = 83.07$; $\sigma = 9.57$), while the mean for the Other group was ($X = 82.96$; $\sigma = 7.14$). The largest mean difference of 7.0 points was noted for the Asian group compared with the Other group. This difference contributed most to the significant F-ratio in this analysis of recoded ethnic groups.

Figure G. Frequency Polygon of Mean Scores for Recoded Ethnic Groups on the "Support Leadership-Importance" Scale

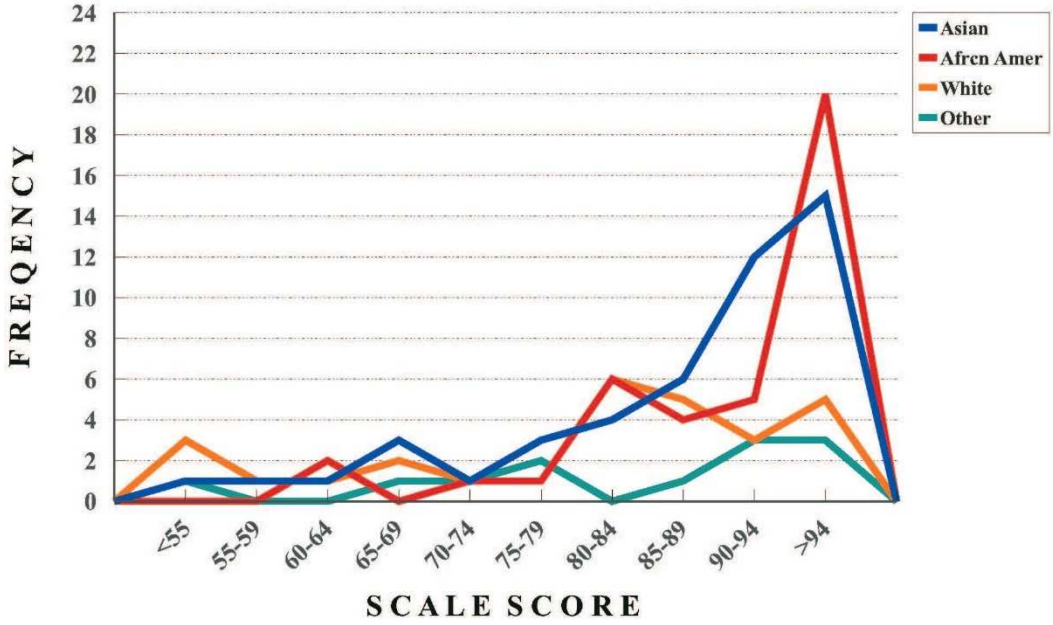


Figure G contains a frequency polygon of mean scores for ethnic groups based on *Working Condition* scale scores. The scores for Asian subjects were negatively skewed, with a high percentage of teachers clustered in the 85 to 100 points range. A similar pattern was shown African American teacher in this display of scale scores. The score pattern for Other teachers in Figure G is more flat than those of Asians and African Americans, with a moderate clustering of scores on the high end of the distribution. This cluster pattern was similar to that of White teachers, yet this group had more scores clustered toward the graph's high end. Also, the distribution was less flat for White teachers. The overall score distribution pattern suggests that Asians and African Americans held more intense views about importance of working conditions in their decisions to remain as teachers in the sampled high schools.

Research Question 3 Summary. The results of the comparative data analysis indicated that gender and ethnicity contributed to viewpoints and attitudes regarding the working condition factor presented in the survey. Significant differences were found in scale score values on two subscale in the data, based on gender. Females in the sample held stronger viewpoints regarding the importance of instructional support and school leadership than their male counterparts. No other statistically significant differences were found in the gender comparisons.

Regarding ethnicity, African Americans and Asians in the research sample, were found to hold more intense viewpoints regarding the importance of school leadership as a factor contributing to a positive work environment. These views contrasted significantly with those of White teachers and teachers of other ethnicity in the sample. A similar pattern was found when comparisons were made of ethnic groups regarding the importance of working condition in general. That is, Asian teachers and African American teachers attained significantly higher mean scores on the scale focused on working conditions, when compared to their counterparts. These finding indicate that working conditions were viewed by the four defined ethnic groups differently as a factor for teacher retention. Moreover, Asians and African Americans gave higher credence to the importance of working conditions in their decisions to remain as teachers in their high school than other subjects.

Analyses for Research Question 4

In review, Research Question 4 focused exclusively on the viewpoints of principals included in the research sample. Person-to-person interviews were used to gather qualitative data on these building leaders, augmenting the survey responses of that assessed the

perspectives of sampled mathematics and science teachers and other education professionals. The interview data provided layered and detailed expressions that were not possible to obtain from closed-ended items commonly used in self-completed surveys. Herein, the interview data of principals specifically pertaining to teacher retention are presented. Research Question 4 was stated as: *How do high school principals perceive their influence on the retention of high school mathematics and science teachers in their buildings?* Six themes emerged from the interviews which captured responses that focused on issues of teacher retention. Using the previously discussed approach to interview data analysis, Table 20 presents a set of six thematic themes emerged from responses given by the interviewed principals. Table 20 contains a summary of the emergent themes and the corresponding frequency of cases associated with the theme is also presented in the table.

Table 20. Emergent Themes for Research Question 4 and Frequencies

#	Emergent Themes	Frequencies	
		Sources	References
1	Build Relationship, Reward, and Acknowledge Teachers	7	11
2	Communication, Transparency, and Collaboration	7	15
3	Professional Development and Support	8	21
4	Awareness of Strengths	5	6
5	Retention Influenced by Demographics and Achievement	6	10
6	Articulated Vision	7	9

An analysis of the interview data revealed that principals consistently reported an effort to build relationships with and acknowledge teachers. Additionally, they reported their commitments toward enhancing communication, transparency, and collaboration amongst their staff. One of the most frequently reported methods of principals for in increasing

teacher retention was providing support and professional development for both novice and veteran teachers.

When asked whether academic achievement or student demographics influenced teacher retention, many principals reported that these two factors, did in fact influence retention for better or for worst. When student achievement and demographics were positive, teachers stayed; when they were negative, teachers left. Another emergent theme from the interview data showed that principals consistently reported that they had a clear vision for their school and they often shared it with their teachers and other staff. The following quotes are evidence of the six emergent themes that aim to address Research Question 4.

Build Relationships, Rewards, and Acknowledge Teachers

"When you're having a formal observation, all of our administrators, but I specifically share with teachers when they come one on one...I know I still get a little nervous when my supervisors here. And when they sit with the principal, I try to really encourage them to let them know, "I am your coach. I am here to give you feedback." So, I think that those are huge ways that we work to keep teachers. We work to build relationships with them, so they feel comfortable in coming to us and letting us know where areas of growth are for them. They don't feel like they have to hide that somewhere." – HSP 7 Principal

"I do a crazy thing where I give my cellphone number out to my entire staff and they call me, or text me…It sets up a better relationship. We sometimes talk off hours, and it's a different feel when it's just two people talking as opposed to principal and teacher, or principal and staff member." – HSP 5 Principal

"I think that we try to show appreciation to teachers. Even when it's not something that they expect. Not just on the days of teacher appreciation day. But we try to do little things to show appreciation for teachers, where we might ... Ice cream social just might pop up, just as something that hey, make sure you stop by and get this. Or make sure, here's a little trinket that everybody's going to get just out of the blue." – HSP 4 Principal

"Just something that's written that goes to teachers. Might be maybe not the cafeteria, they may not like cafeteria food, but still a little card to tell your birthday, go eat in the cafeteria, free lunch or something. Just little, I think trying to do little things to show appreciation. And sometimes you do certain departments, you might celebrate a department for something that's been going on. And just periodically throughout the year." – HSP 4 Principal

"I notice with my teachers, the one thing that they seek from me, and which I believe is why they're still here, is they love to see me in their classroom. Non-evaluative, just show up, and they like the fact that I ask about them personally. 'How are your children? How are you feeling today?' So, I take a personal interest in their well-being, and then the fact that I stop by and see them in their teaching mode, I believe, is one of the greatest things that they look for from me and they want to see from me." – HSP 2 Principal

Communication, Transparency, and Collaboration

"I attend the department meetings; I attend the collaborative plannings. We have rolling staff meetings here, so it's a smaller group. And the reason I changed to rolling staff meetings as opposed to whole-staff staff meetings is because I have a large staff. And in a

rolling staff meeting it's much smaller groups, maybe 20 people and they can engage with me better that way." – HSP 4 Principal

"Collaborative in nature. I have an open-door policy. I like to make sure that I'm accessible to staff after explaining the expectation. Pretty much my working relationship with staff is founded in our three core principles of, number one, making sure that all the decisions that we make are based in the best interest of students, secondly that we use a holistic approach when working with our students, focus around our IV learner traits and then thirdly that we use a teamwork approach to get our work done, so I think that kind of encapsulates my working relationship with our staff, and I believe in recognizing staff when they are not only on target but actually producing quality instruction and supporting student learning." – HSP 3 Principal

"Also, the communication piece. Making sure that the staff is fully aware of everything that's germane to system initiatives, departmental initiatives. Also, I think loosely influence through modeling and coaching is the use of positive reinforcement and positive communications. Communication from administrator to teacher, teacher to teacher, teacher to student. I think that it's incumbent upon the instructional leader to model that type of style." –HSP 1 Principal

"I think we have a very good working relationship. We have been working on changing mindsets. A lot of the staff are older and have a fixed mindset. As a staff, we all decided that this year was going to be our year that we focus on growth mindset, changing

some of our perceptions of how things have always been done, and just looking for more efficient ways to do things as a team, all on the same page." – HSP 6 Principal

Professional Development and Support

"We have new teacher academies. We have incentives where we celebrate teachers. We encourage them to be a part of all parts of the building. Again, we talk about a homecoming week or that school spirit to become infectious, but I think that we encourage them through the professional development that we offer, the coaching feedback that we give them, that one on one." – HSP 7 Principal

"Absolutely. When you see a teacher that is struggling no matter the year of their experience, you provide them the time and the space to have support and you give support from their department leaders. We have what we call a school instructional tool, where the department chairs and school leaders meet often to talk about data. And data could mean cultural data, academic data, suspension data, attendance data. But information befitting the high school." –HSP 1 Principal

"Wow, influence teacher retention. I'm going to be honest, administrative support, feeling supported, someone having a belief in you, and your working conditions, working conditions. You've got to feel that your building, where you're coming every day is clean and safe." – HSP 5 Principal

Awareness of Strengths

"I am still learning how to differentiate for adults and that is very difficult sometimes. Especially when you're not utilizing data sets, such as classroom data sets or going back to that. But when you're utilizing just some communication moves and those pieces of how to differentiate for them. And responsibility is also one of my top themes that I'm working through, because it is a weakness for me and an area of need or support, because I take on all the responsibility and when something is not done I don't ... even if I don't do it myself, I know who to go to get it done and it may not have been their responsibility." – HSP 7 Principal

"Okay. Strengths, let's see. Strengths, definitely a people person, I'm positive, responsible. Those are my top three strengths…I took my Gallup StrengthsFinder. I also have learner as one of mine because you're learning something new every day, so learner is also one of mine. Then the other one, of course, is strategic." – HSP 6 Principal

Retention Influenced by Demographics and Achievement

When asked do you think student achievement data impacts student retention in your school…

"Because standardized student achievement data does not…I do not believe that affects teacher retention. However, I do believe attendance data. I do believe that day to day assignment data, homework, things of that nature, and just the submission of. And when I say attendance, I'm talking about tardy, truancy, things of that nature. I believe that affects." – HSP 7 Principal

"You know, we're a very diverse school. I think we're 60% African American, 20% Caucasian, 25% Hispanic, and I'd say 20% Hispanic. But that diversity really plays a big part I think, in allowing not only the teachers to get a cross section of students, and really bring those students together. And to communicate, we form good units. Get the students an opportunity to share and to get to understand other students. And start understanding how to work in a real society. So that is…A big factor. You know, I can't ... cannot pinpoint that. That's where your research will tell me, but I think to see a diverse group of students, to get information from that diverse group, on a gets ... I don't know, to assess the data. When you're assessing their test scores- That might be one way to look at okay, I could work with this group, and really have an impact. Let's see how different groups perform. Or that could be, that could be part of why teachers want to continue, diversity is a big part." – HSP 4 Principal

"Demographics. I guess yeah, I'm going to say it does because they want to see a diverse population. Our school is very diverse, so I think that has. Some teachers actually come in wanting to be a part of a diverse population. I feel that's a good thing to have for teacher retention but also a good selling point." – HSP 6 Principal

Articulated Vision

"Gotcha. Absolutely. I share a clear vision with our teachers, so for example, our school vision is, High School 3 strives to be a world class high school, and our school mission statement basically states that we're driven to produce students who are effective communicators, who are globally minded problem solvers and who are focused on making

the world around them a better place. That's the mission statement. With staff, I usually approach it talking a lot about teamwork and collaboration to make that happen." – HSP 3 Principal

"I do have a shared vision particularly around providing an individualized education program for our students. An example would be because many of them are over-age and under-credited we really have to look at ways to accelerate the individual student. So there really is no "one-size fits all" for any of my students because again, some of them have been in school two years, some have been in school five years and some of them have even been in school six years. So trying to provide them with immediate access to what they need in order to get a high school diploma definitely is the language that we all speak. I definitely think they understand the importance of that." – HSP 8 Principal

"Well I think that I try to communicate the vision on what we're trying to build is rigor. Rigorous instruction, and make our instruction relevant to students. And I think that we are sharing that vision, and that we are working to make that happen. And every little thing that we do, even the way we're going to spend money for professional development is built around that rigorous instruction, with most likely corroboration. Which goes back to common assessments. Working together with lesson planning. So I feel that we're really on that page. The teachers are on that page. It's a struggle for some people, but everybody's heading in that direction." – HSP 4 Principal

"But the vision is still the same, we want to make sure that we uphold the tenants of MASD. The vision that I share with teachers are always rooted in the vision of the school district. I think it's one and the same. So, anytime there's a beginning of a school year we start with what our district initiatives are. And then what our quest or initiatives are. And that vision is always articulated. I think it's incumbent upon an instructional leader to always put their spin on the vision in terms of their educational philosophy, but at the end of the day, I think no matter what the vision is inclusive of success for all students." – HSP 1 Principal

"I believe a shared vision is for students to be college ready. Teachers and I both, we all believe that students need to have a certain skill set in order to be successful. So we are in agreement that students should be able to read and write effectively. We are on board with that. We also believe that students need to demonstrate certain core values, such as respect, being responsible, being a good citizen. So, helping to socially develop our students to that capacity, as well as provide the instructional strategies needed to help students, we are on one accord in meeting that vision." – HSP 2 Principal

Research Question 4 Summary

In general, the principals interviewed in this study were active in their support of teachers, often engaging in specific initiative to support new teachers. A vision of academic success for the high school was expressed by all principals, with variations as to what the vision might be for a particular vision. Only one principal did not engage in an active effort to keep teachers in the school, but rather state tacit support for whatever career options an

education professional exercised. Essentially, there was nearly uniform agreement among the interviewed principals about making conscious effort to keep teachers in their buildings.

Principals largely viewed collaborative relationships with the teaching staff as having a positive influence on working conditions and attendant teacher retention. Effective and open communications between the principals and the teaching staff was also highlighted as a positive influence on teacher retention. In contrast, some principals viewed themselves as having poor communications with teachers and possibly negatively influencing teacher retention with performance expectations that were too high.

Regarding student achievement, there were mix viewpoints offered by principals included in the sample. For certain cases, the performance data showed strong achievement within the students for a given high school and teachers seemed committed to being part of those successes. In other cases, the low performance levels of students were viewed by principals was deterring teaching from remaining in the school and possibly the district, as well. Yet, the prevailing viewpoint among interviewed principals was that achievement data had no bearing on teacher retention, despite standard performance levels of students and the need for some improvements in academic achievement within the building.

Descriptive Analyses

Principal Sample. Participants in the study were characterized by several items included in the demographic portion of the interview. Participants were asked about their years of experience, teaching certification, ethnicity, and gender.

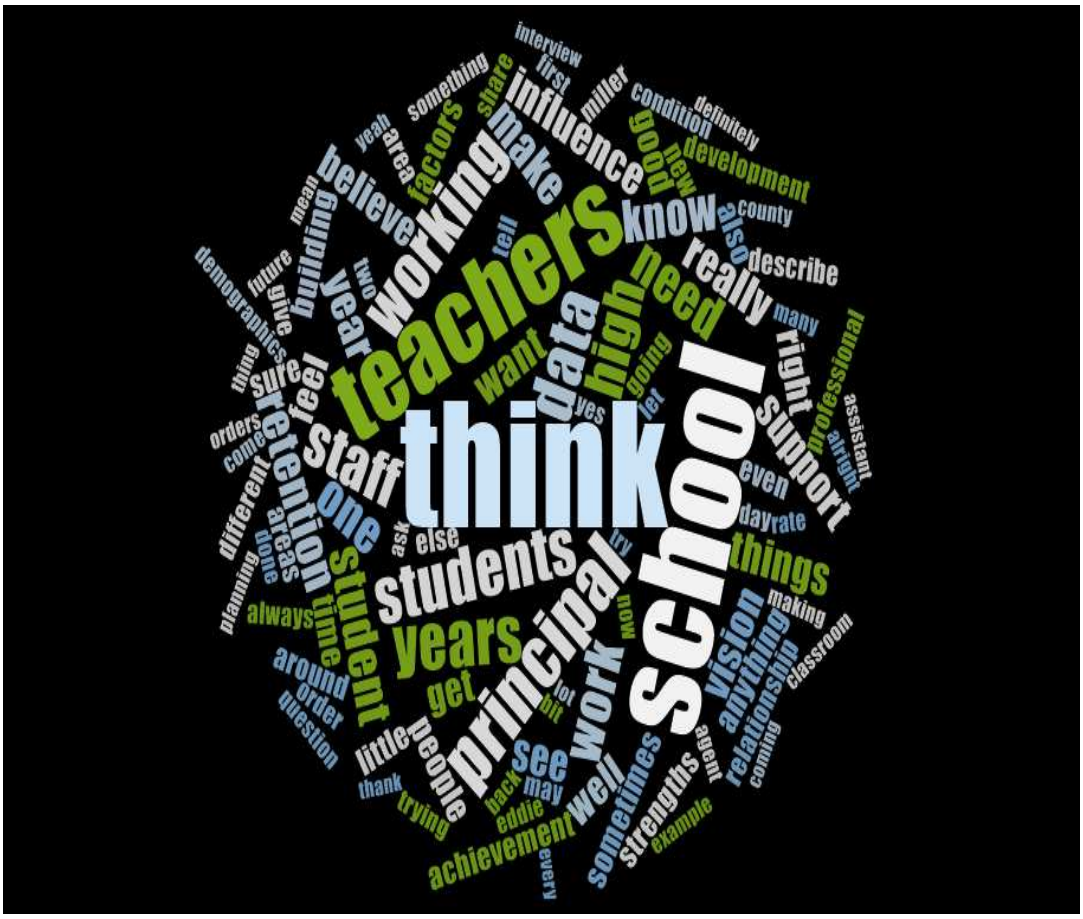
Table F describes the demographic profile of each interview participant.

Table F. Demographic Profile of Interview Participants

School	Yrs Experience Overall	Yrs Experience P.G. County District	Yrs Experience in Current School	Teaching Certification Status	Ethnicity	Role	Gender
HS 7	15	15	7	Maryland State Teaching Certificate	Black/African American	Principal	Female
HS 2	23	23	10	Maryland State Teaching Certificate	Black/African American	Principal	Female
HS 6	20	20	5	Maryland State Teaching Certificate	Black/African American	Principal	Female
HS 5	24	9	4	Maryland State Teaching Certificate	Other	Principal	Female
HS 4	23	23	20	Maryland State Teaching Certificate	Black/African American	Principal	Male
HS 3	25	10	4	Maryland State Teaching Certificate	Black/African American	Principal	Male
HS 8	25	25	2	Maryland State Teaching Certificate	Black/African American	Principal	Female
HS 1	26	26	2	Maryland State Teaching Certificate	Black/African American	Principal	Female

Figure 1.

Word Cloud: 100 Most Used Words in the Dataset



Data Map

Table G displays a visual representation of the Data Map used in the current investigation to plan the coding strategies for the qualitative analysis. The Data Map highlights the key focus group protocol items that aim to specifically answer the primary research question.

Table G. Data Map of Research questions

Research Questions	**Quantitative Instrument**	**Qualitative Interview Items**
1.What importance do high school mathematics and science teachers place on various instructional support and school leadership factors as an influence on working conditions, and what is the perceived control level of school principals on these instructional groups and school leadership factors?	Focus: Instructional Support School Leadership Factors Working Conditions Perceived Control Level	N/A
2. What specific working conditions do high school mathematics and science teachers report as influencing their decisions to remain in the school district, and what is the perceived control level of school principals on the working conditions?	Focus: Working Conditions Retention	Item #4 Explain the working condition factors that you believe you influence. For example: teacher collaboration, professional development, and mentoring. Item #5 Describe the areas you feel you don't have influence?
3. Does the influence of working conditions differ among high school mathematics and science teachers based on teaching experience and other background characteristics?	Focus: Working Conditions Teaching Experience Background Characteristics	N/A
4. How do high school principals perceive their influence on the retention of high school mathematics and science teachers in their buildings?	N/A	Item #7 (7a.) Describe the student achievement data of your school. (7b.) In your opinion, do you think student achievement data impacts teacher retention in your school? Item #8 (8a.) Do you consciously make an effort to keep teachers? (8b.) What do you do?

Discussion

Summary

The premise upon which this research was structured stated that mathematics and science teachers are more likely than other teachers to leave their current positions. Implication of this assertion, supported by earlier research, pose a substantial challenge for school district administrators—most critically school principals. A principal, including this researcher, would certainly need to explore and to understand key factors that influence a decision-making process for any teacher leaving a current placement. It does not matter of the choice might be a building transfer or the pursuit of a new career altogether. The impact on a school is the same. That is, resources expended on recruitment and professional development of new or replacement teachers are substantial and can contribute substantially to school failure.

For exploring the importance of the current study relative to principals, it is useful to quote an ancient proverb from West Africa that states:

Not to know is

bad . . .

Not to wish knowing is worse . . .

True, the proverb is a non sequitur, yet it provides a clear conceptual path for understanding the meaningfulness of findings generated from this study. Despite speculation, central and building level administrators for District B did not truly "*know*" the reasons for exceedingly high levels of teacher attrition over the past decade or more. This was, of course, the "*bad*" as reflected defined by the aforementioned African proverb. However, important knowledge gaps have been filled by current research findings.

Survey responses from sampled mathematics and science teachers revealed that teaching assignment was the most critical factor influencing their decisions to remain at the current school. Yet, other factors such as class size, subject taught, and student demographics played a prominent role in decisions to remain within a current teaching position or to leave. Even more critically, the study revealed that teachers generally believed that the building principal, through budgeting, ultimately decided the academic priorities of the school and implemented specific academic programs, including AP courses, elective classes, and academies.

Here is where the "*to wish knowing*" part of the African proverb comes into play. Teachers need to be provided with more details about school finance and budgetary realities. Principals, including this researcher, have an important role in helping teachers make informed decisions about career options. There are areas where a principal may have some level of control over certain matters, but this control is mitigated by factors well beyond the work environment of a school building. For example, the demographics of child populations

served by a school cannot be changed by administrative fiat or policy modification. Income, family structure, and sociocultural factors of child populations are largely organically determined and supersede the rational control of any education administrator at the building level or otherwise.

This demographic issue is not necessarily an insurmountable problem, but rather an opportunity for effective communications between teachers, school principals, and central administrators. Further, careful sharing of empirical data from this current study and other relevant research should be used for implementing useful management strategies where teaching staff and administrators work collaboratively to structure budgets that optimize resources for a given school building. Thus, "*knowing*" what fiscal and logistic problems prevail can allay many concerns among teachers about work place conditions and possibly reduce attrition rates.

Another example is teachers perceived that principals have a strong level of control over the physical plant (e.g., heating and cooling) and the daily maintenance of the building, while principals viewed themselves as having limited control over the aspects of the workplace environment, specifically individual room temperatures. Despite teacher perceptions, the reality is principals do not have direct control over the physical climate within school buildings of District B. Guidelines and procedures for setting the temperature in a school building and within classrooms are centrally determined and remain outside the principal's control. However, the principal's true responsibility is to ensure work orders are

written and meet established standards for building and classroom conditions that are not being met. In some cases, accommodations are made for teachers and students that are impacted by negative school and classroom conditions. The gap between teacher perception of a principals' control versus limitations is too often quite wide. Retention levels for mathematics and science teachers might improve if these education professionals would more readily apprised of certain realities in the administrative process.

Again, the current study has revealed a conception that teacher perceptions do not always jibe with facts on the ground. Principals can provide a level of instructional support, physical plant maintenance, and professional development, and it is fair to expect strong school leadership. Nevertheless, the limitations of administrative controls must be made clear. If the sharing of empirical data such as findings from this current research is to be meaningful, it must serve to produce a more informed staff of teachers, particularly those education professionals involved with mathematics and science instruction.

Returning to the African proverb, at each level of the education delivery system for District B there must be a willingness "*to wish knowing*" how the process works of resource planning, funding, and distribution. Such knowledge could yield a substantial improvement in teacher retention levels.

Limitations.

There are certain limitations to consider when interpreting results of this study. One limitation is that the teachers were not interviewed. Although the survey data provides quantitative data about perceptions of working conditions, conducting person-to-person interviews of teachers would have provided more textured details about workplace factors influencing retention rates. A mixture of quantitative and qualitative data regarding teacher perception would be an improvement upon the current research design. Findings from such a study would allow for a stronger comparison between the principal's strategies regarding teacher retention and teachers response to those retention strategies.

Another limitation in this study is the sample size. In District B, there are over 30 high school programs leading to a high school diploma and the sample size of the population represented 25% of the high school programs. This means that 75% of the high school programs were not included and the number of math and science teachers who did not participate is considerably large as well. Depending on statistical error levels, a small sample size can lead to misleading conclusions about the breadth of teacher retention factors for an urban school district the size of District B. With wide variance in geographic characteristic and school population dimensions, information about working condition factors and principal actions that influence teacher retention may have been missed during the data collection process.

Subjects selected for this study represented mathematics and science teachers at eight select high schools in District B. It is possible that teachers of other subject areas may have

ranked the working condition factors in differing ways, based on unique perceptions of a principal's role and influences. Further, there may be problems casting implications from this current study to reflect all mathematics and science teacher district wide. Given the limited sample size used herein, the possibility of erroneous generalizations and conclusions is noteworthy.

Conducted in a large, urban setting, data from this study reflect one of the top 20 largest school districts within the United States. Results from a study of this nature may differ from finds for a rural school district, even when identical research methods are employed. Thus, another limitation is the relative comparability of current data with dissimilar rural districts, where workplace conditions may prove strikingly different. For example, career enhancement options may be more limited in rural settings for mathematics and science teachers based on economic conditions. Teachers in rural areas could be less inclined to seek other teaching positions or possibly transferring to another school district if compensation levels are depressed. These types of socioeconomic factors could limit the scope and meaning of retention data when geographic settings are at issue. Therefore, the reasoning of decision-making of teachers relative to career changes must be carefully weighed when urban versus rural settings are considered, which limits the current findings.

One final limitation of the current study was the relationship of the researcher to the select high school principals. This researcher visited each of the selected high schools to distribute and collect consent forms from the teachers and may have been identified as a principal in District B. The identification of the researcher as a colleague of another building's principal may have caused some teachers to modify survey responses fear of

information sharing and possible retribution. Despite the quantitative data being analyzed anonymously, a teacher's lack of trust for the integrity of research methods is a possible source of response bias.

Principals, too, may have provided tempered responses for similar reasons of trust, thereby possibly biasing the research data. To eliminate such sources of bias with principals, the researcher (1) used eight interview questions that were objectively focused and contained little or no socially challenging content; (2) the interview protocol was uniformly administered to all interviewees with no variation in question content or format; and (3) and response data from each interviewee was digitally recorded and subsequently coded for emergent themes without subject specific identifiers.

Future Research.

Given the recent emphasis on the importance of STEM (Science, Technology, Engineering, and Mathematics) integration nationwide, it may be helpful for future research to examine this topic with emphasis on the working condition factors that influence STEM teachers to remain in teaching. In order for students to perform well on standardized assessments related to the STEM field, there is a need for a consistent workforce of STEM teachers who are willing to remain in the teaching field. For example, a qualitative study of high schools that have identified STEM specialty programs and high schools where there aren't any STEM specialty programs. By examining the retention rate of STEM teachers at such schools, it may lead to the identification of working condition factors that are important to STEM teachers specifically and may help with development of strategies that prompt their desire to remain in teaching. Student standardized STEM

assessments is a direct reflection of the types of STEM integration programs that they may have participated in at their school. The consistency of a workforce that has working conditions conducive to teacher retention only increases student achievement possibility.

As the current study focused on collecting quantitative data from teachers regarding the importance of working conditions factors and principal control, future studies should replicate the current design for adding empirical data that will enhance the knowledge base on teacher retention. It is not enough to have a single study on any critical topic, but rather social and behavioral researchers must focus consistent effort on finding solutions to teacher retention issues. Already discussed were possible shortcomings in this study. Thus, future studies should apply upgraded methodological approaches the improve sampling, increase data collection breadth, and reduce areas of design bias. This does not negate the importance of current findings, but rather suggests that future studies adopt and adapt the mixed method approach for improving upon these data.

Implications for the school district.

As discussed earlier, findings of this study suggested the need for a convergence of teacher perceptions of working condition factors and the reality of a principal's influence. Moreover, effective communication of resource limitations, sociocultural conditions, and political conditions with mathematics and science teachers is critical. Retention strategies must not be viewed as an external approach applied to teachers, but instead a integrative dynamic that incorporates teachers into the school management and education delivery processes. Further, key findings emerging from this study suggested that teachers clearly understood the importance of pedagogic challenges surrounding high professional standards

for the instruction, appropriate instructional materials, teacher assignment, and support from school administration. Personal relationships and professional mentoring were also found to be important components of a healthy workplace environment, particularly when supported by school principal committed to educational excellence. Based on the findings, the recommendations for District B:

- Identify each academic year, a percentage of schools with a relative high number of newly hired teachers and assist the principals with creating a support system for new teachers.
- District B should identify teacher retention strategies implemented by each building principal at the elementary, middle, and high school level.
- Determinations should be made about which teacher retention strategies are going to be implemented by the school district and which will be implemented by the school principal. This will increase communication and expectations as what does teacher support look like in the school district.
- Align quality of school leadership practices with the principal evaluation demonstrating and communicating the importance and alignment with the district's goal of teacher retention.
- Identify systemic new-teacher support strategies that insures every teacher receives a level of support and mentoring, thereby increasing teacher retention.

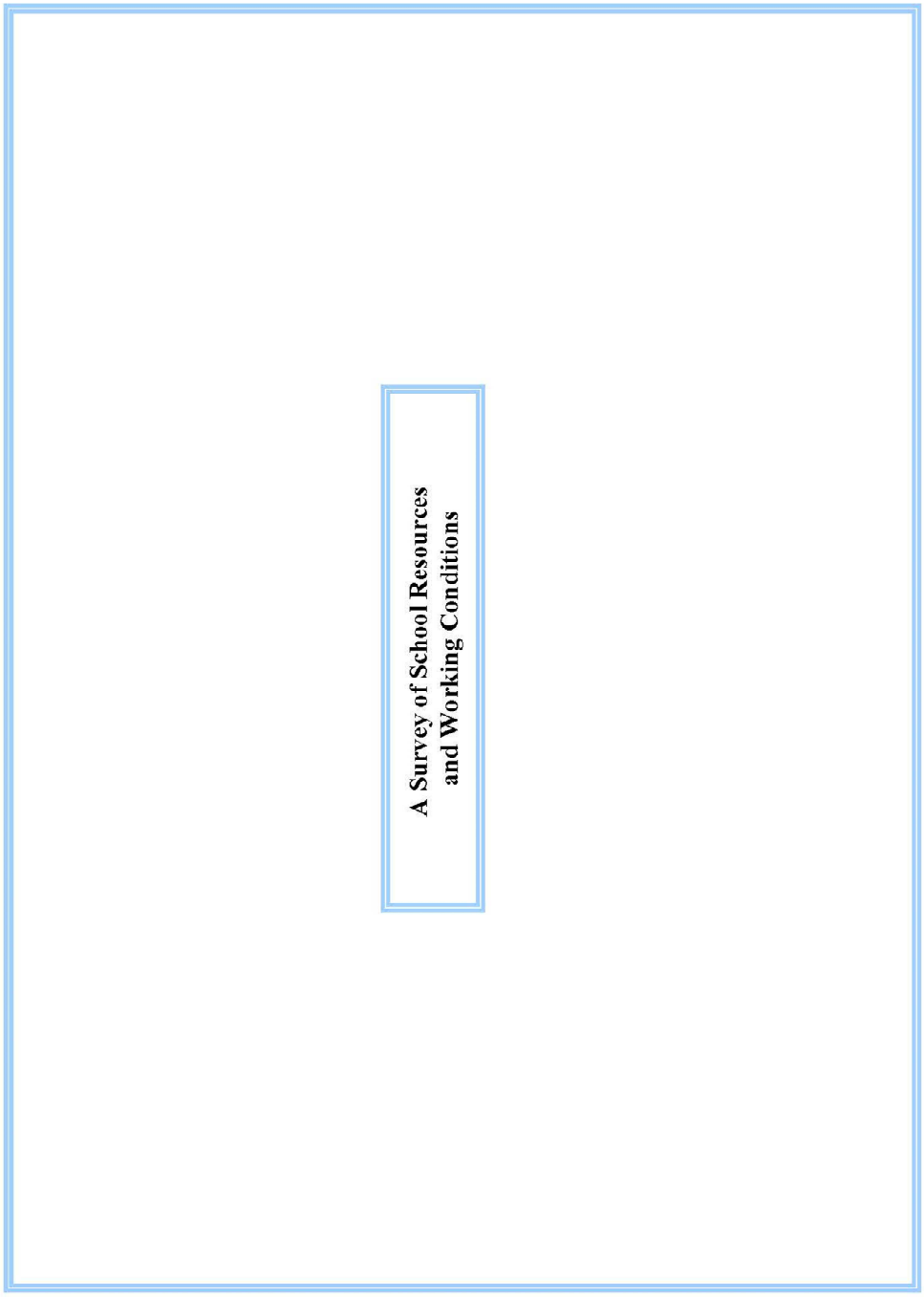
- Identify common physical plant challenges that principals are stating impact the overall working conditions. Determine a plan or a time line of solvency to support teacher retention.

APPENDICES

Appendix A: District B FARM's chart

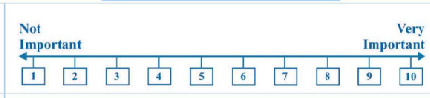
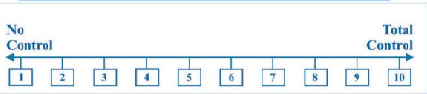
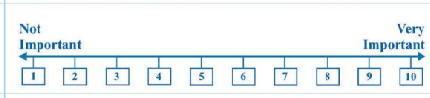
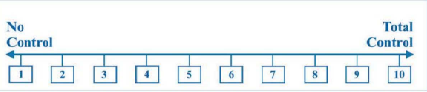
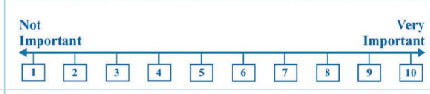
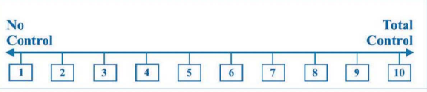
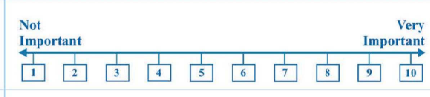
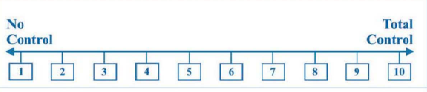
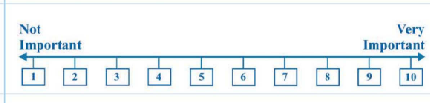
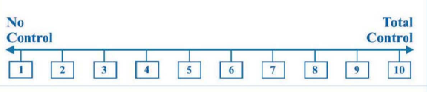
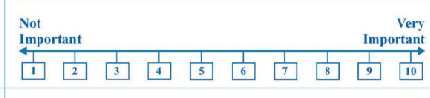
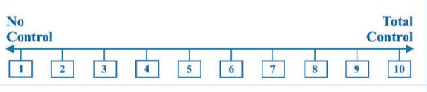
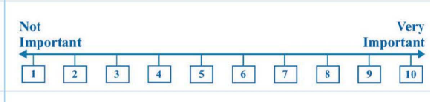
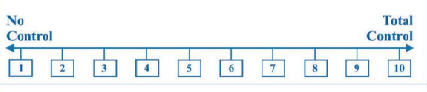
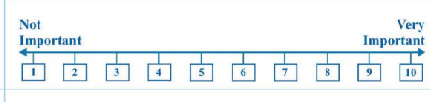
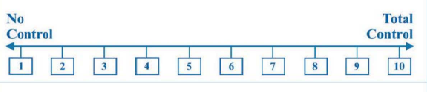
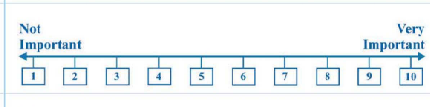
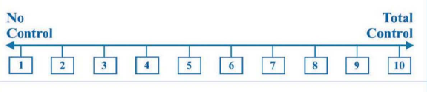
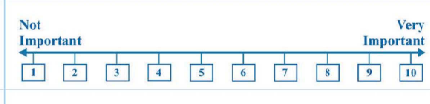
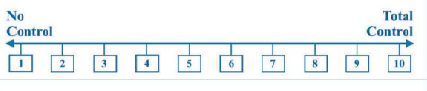
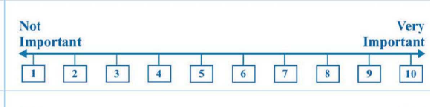
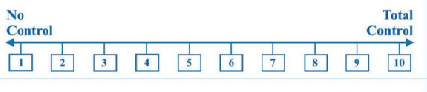
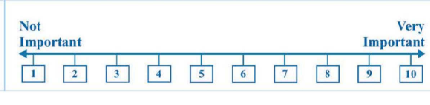
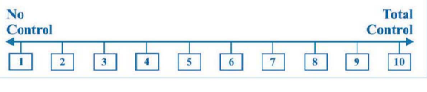
High Schools	Free and Reduced Meal Population	Total school population	FRPL %
HS 1	**640**	**2,383**	**26.90%**
HS 2	**330**	**923**	**35.80%**
HS 3	**403**	**1,036**	**38.90%**
HS 4	**1039**	**2,516**	**41.30%**
HS 5	883	2,067	42.70%
HS 6	958	2,171	44.10%
HS 7	642	1,423	45.10%
HS 8	430	921	46.70%
HS 9	431	860	50.10%
HS 10	362	715	50.60%
HS 11	1017	1,859	54.70%
HS 12	972	1,695	57.30%
HS 13	616	1,040	59.20%
HS 14	1080	1,687	64.00%
HS 15	841	1,287	65.30%
HS 16	448	659	68.00%
HS 17	688	992	69.40%
HS 18	**1,597**	**2,230**	**71.60%**
HS 19	**1,586**	**2,202**	**72.00%**
HS 20	**1,343**	**1,825**	**73.00%**
HS 21	**1,942**	**2,435**	**79.80%**

Appendix B: Survey



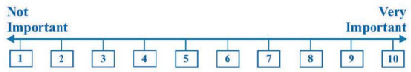
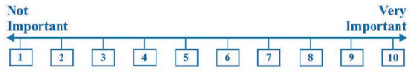
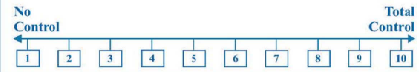
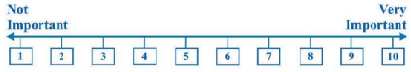
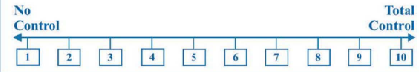
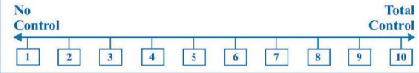
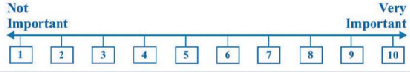
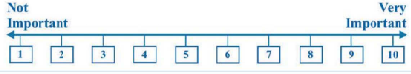
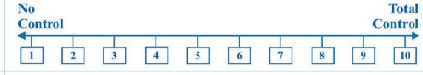
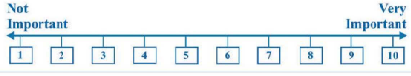
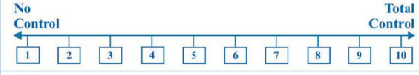
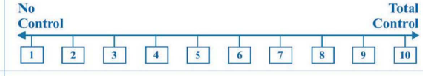
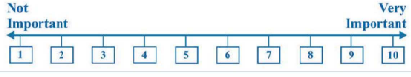
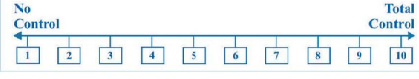
INSTRUCTIONAL SUPPORT

The following page presents a series of statements that pertain to various types of **supports** that may exists in your school setting for enhancing academic outcomes. Using the two attached rating scales, select the number that most closely reflects your viewpoints regarding **"Importance"** and **"Principal's Control Level."** Please respond to each item, but do not spend more a few seconds deciding upon a rating for any item.

Item	Importance	Principal's Control Level
1. Teachers have sufficient access to appropriate instructional materials.		
2. Teachers have sufficient access to instructional technology (e.g., hardware, software, etc.).		
3. Teachers have access to reliable communication technology (e.g., phones, faxes, email, etc.).		
4. Teachers have sufficient access to office equipment and supplies (e.g., copy machines, paper, pens, etc.).		
5. Teachers have sufficient access to a broad range of professional support personnel.		
6. The school environment is clean and well maintained.		
7. Teachers have adequate space to work productively.		
8. The physical environment of classrooms in this school supports teaching and learning.		
9. Teachers are encouraged to try new things to improve instruction.		
10. Teachers have autonomy to make decisions about instructional delivery.		
11. Sufficient resources are available for professional development in my school.		
12. Professional development is data driven and structured to refine teaching practices.		

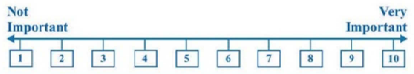
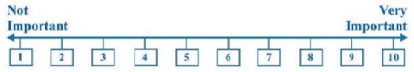
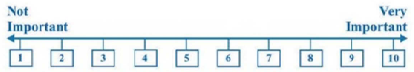
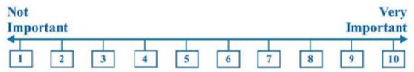
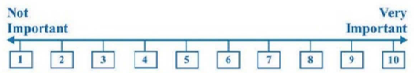
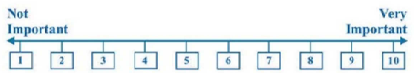
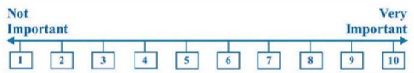
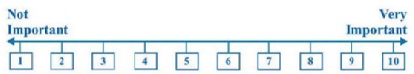
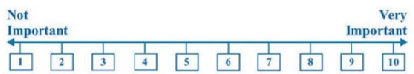
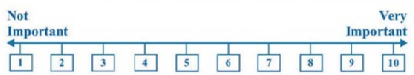
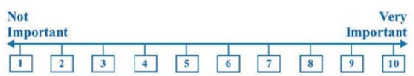
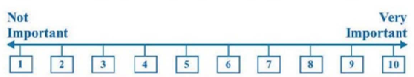
SCHOOL LEADERSHIP

The following page presents a series of statements that pertain to various type of **administrative** or **leadership** characteristics present in your school building. Using the two attached rating scales, select the number that most closely reflects your viewpoints regarding **"Importance"** and **"Principal's Control Level."** Please respond to each item, but do not spend more a few seconds deciding upon a rating for any item.

Item	Importance	Principal's Control Level
1. The faculty and leadership have a shared vision.		
2. There is an atmosphere of trust and mutual respect in this school.		
3. Teachers feel comfortable raising issues and concerns that are important to them.		
4. Teachers are held to high professional standards for delivering instruction.		
5. The school leadership facilitates using data to improve student learning outcomes.		
6. Teacher performance is assessed objectively.		
7. Teachers receive feedback that can help them improve instructional effectiveness.		
8. The procedures for teacher evaluation are consistent.		
9. The school improvement team provides effective leadership at this school.		
10. The faculty are recognized for accomplishments.		
11. Teachers are recognized as educational experts.		
12. Teachers have an appropriate level of influence on decision making in this school.		

WORKING CONDITIONS

The following page presents a series of statements that pertain to various the type of **working conditions** within your current school that might influence your decision to remain as a employee of the district. Using the attached rating scale, select the number that most closely reflects your viewpoints regarding **"Importance"** given to an item. Please respond to each item, but do not spend more a few seconds deciding upon a rating for any item.

Item	Importance
1. Facilities and/or resources.	
2. Support from school administration.	
3. Collegial support and atmosphere amongst the school staff.	
4. Teaching assignment (class size, subject, student demographics, etc.)	
5. Effectiveness with the students I teach.	
6. Focus on testing and accountability.	
7. Personal reasons (health, family, etc.).	
8. Job security and benefits.	
9. The quality of school leadership.	
10. Professional development opportunities.	
11. The ability to participate in decisions that affect my school and/or classroom.	
12. Building climate, student demographics, and student conduct.	

Background Information

Please respond to each of the following information items. For indicating the number of years as a teacher, round your response to nearest whole number (e.g., six month = 1 yr.).

Years of Teaching Experience:

Overall: ☐☐ yrs.
in P.G. County District: ☐☐ yrs.
in Current Building: ☐☐ yrs.

Current Position:

☐ Instructor Coach ☐ Teacher
☐ Assistant Principal ☐ Principal
☐ Other

Teacher Certification Status:

☐ Maryland State Certificate
☐ Other State Certificate
☐ Not Certified

Grade Level Currently Teaching:

☐ 7th Grade ☐ 10th Grade
☐ 8th Grade ☐ 11th Grade
☐ 9th Grade ☐ 12th Grade
☐ Other

Ethnic Background:

☐ American Indian/ Alaskan Native
☐ Asian
☐ Black/African American
☐ Hispanic/Latino
☐ Native Hawaiian/Other Pacific Islander
☐ White
☐ Other

Gender:

☐ Female
☐ Male

Thank You!

Appendix C: Permission Letter for survey use by researcher

NEW TEACHER

CENTER

NEW TEACHER CENTER TELL SURVEY LICENSING AGREEMENT

This agreement ("Agreement") by and between **New Teacher Center,** a California public benefit corporation ("NTC") and **Nathaniel R. Laney** ("Requestor") is effective upon a fully executed Agreement being in place.WHEREAS, NTC offers K-12 induction, teacher and school leader professional development, and teaching and learning condition survey services for teachers and school administrators. WHEREAS, NTC's Teaching, Empowering, Leading and Learning (TELL) survey originates from the Governor's Teacher Working Conditions Initiative in the Office of the Governor, North Carolina (2002-2009), has been adapted by NTC, and has been externally validated by the American Institute for Research.

WHEREAS, Requestor desires to license the TELL survey instrument ("Instrument") identified in **Exhibit** A from NTC for use in this project. Requestor would like to use the Instrument for research into the following questions, 1) **What are the working condition factors that influence high school math and science teachers to remain in the profession?; 2) From the perspective of high school math and science teachers, how do principals influence teacher retention?; and 3) From the perspective of principals, what influence does their support have upon teacher retention?** ("Proposed Use").

NOW, THEREFORE, in consideration of the mutual covenants and promises contained herein and for other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the parties hereby agree as follows:

1. License. Subject to Requestor's complete and ongoing compliance with this Agreement, NTC grants Requestor a non-exclusive, non-transferable, non-sublicenseable, revocable license to NTC's rights in the Instrument solely for the Proposed Use. As between the parties, NTC retains all right, title and interest in and to the Instrument. Requestor obtains only the rights specifically granted in this Agreement; NTC reserves all rights not specifically granted. Requestor may not directly or indirectly receive remuneration, financial or otherwise, from or on behalf of the recipient in exchange for the Instrument and may not use or disclose the Instrument for marketing purposes. Requestor may not access or use the Instrument for any purpose other than expressed in this Agreement. Requestor may not remove any disclaimer, copyright, trademark, proprietary rights, or other notice included on or embedded in the Instrument.

2. Fees. No fee applies.

3. Personnel. Requestor shall ensure that its workforce members and employees are aware of and agree to comply with the provisions of this Agreement.

4. Term of the Agreement. The license granted by this Agreement is effective upon the full execution of this Agreement and continue until **November 30, 2017.** NTC may terminate this Agreement at any time following 30 days notice to Requestor.

5. Trademarks. NTC hereby grants to Requestor a limited, non-exclusive, non-transferable, nonsublicenseable license to display NTC's trademarks, trade names, logos and other proprietary notices (the "NTC Marks") as part of the attribution requirements set forth in this Agreement. Any display of the NTC Marks is subject to the NTC's trademark usage guidelines as may be provided by NTC in writing to Requestor from time to time.

6. Attribution. Requestor must provide attribution by specifying the following on any materials containing questions from the Instrument: "New Teacher Center's Teaching Conditions Survey Questions, which had their origin in the Office of the Governor, North Carolina (2002-2009)." The Instrument contains questions from the NTC TELL initiative and attribution will not reference the name TELL, as the TELL name involves services to clients unique to the TELL Initiative. NTC reserves the right to modify the attribution requirements from time to time during the term of this Agreement, and Requestor agrees to abide by such updated requirements.

7. Publication. Requestor agrees that for any internal or external publications that result from the use of the Instrument, Requestor will provide NTC with a copy of such publication at least thirty (30) days prior to submission for publication to allow NTC to reasonably review and amend the publication. If Requestor believes it cannot meet the thirty (30) day notice requirement before publication, it must notify NTC before the deadline. NTC may in its sole discretion disallow the publication if it determines that Requestor has violated any provision of this Agreement.

8. License to Publications. Upon publication in accordance with Section 7, Requestor grants NTC a perpetual, worldwide, non-exclusive, non-transferable, non-sublicenseable, royalty-free license to use, reproduce, distribute, publish, and display for any purpose — including marketing or any other commercial purpose — publications that result from the use of the Instrument. Requestor shall furnish, upon NTC's request, a digital copy of any publications covered under this Section.

9. Independent Contractor. NTC is an independent contractor. Neither party shall represent itself as the agent or legal representative of the other party for any purpose

whatsoever, and shall have no right to create or assume any obligation of any kind, express or implied, for or on behalf of the other party in any way whatsoever. This Agreement will not create or be deemed to create or imply any relationship between the parties in the nature of any joint venture, employer/employee, principal/agent or partnership.

10. Limitation of NTC Liability. Under no circumstances, and under no legal theory, whether in tort, contract, or otherwise will NTC or its directors, officers, employees, or agents be liable for any special, indirect, incidental, consequential, punitive or exemplary damages (including, without limitation, loss of goodwill, or cost of cover) arising out of or relating to this Agreement, even if NTC has been advised of the possibility of such damages.

11. No Warranties by NTC. The Instrument is provided to Requestor on an "as is" basis. NTC makes no representations or warranties of any kind, whether oral or written, whether express, implied, or arising by statute, custom, course of dealing or trade usage, with respect to the Instrument.

12. Indemnification. Requestor shall defend, indemnify, and hold harmless NTC from and against any and all losses, costs, damages, government-issued fines, or expenses, including reasonable attorneys' fees, that arise out of any contractual breach of this Agreement by Requestor, violations of any applicable laws and regulations by Requestor, and/or the need for NTC to enforce any provision of this Agreement.

13. Notice. Any notice required or permitted by the terms of this Agreement shall be sent via email if possible to:

New Teacher Center
c/o Phillip G. Lee
110 Cooper Street, Suite 500
Santa Cruz, CA 95060
plee@newteachercenter.org

Nathaniel R. Laney
5009 Oakland Way
Suitland, MD 20746
nathaniel.laney@pgcps.org
301-655-1095

14. Governing Law; Jurisdiction. This Agreement is governed by California law. NTC and Requestor consent to the exclusive jurisdiction of the state and federal courts for Santa Cruz, California.

15. Force Majeure. Neither party will be required to perform or be held liable for failure to perform if, beyond the control of either party, nonperformance is caused by destruction, material damage, or other unavailability of facilities at project sites; strikes or other labor disputes; national emergency; acts of God; the elements; power failures, computer system hacking, or software or hardware failures; or any other causes beyond the control of the party unable to perform. The nonperforming party will notify the other of such problems and will use reasonable efforts to address the problem and carry out its obligations.

16. Injunction. Notwithstanding any other rights or remedies provided for in this Agreement, NTC retains all rights to injunctive relief to prevent or stop the unauthorized use or disclosure of the Instrument by Requestor, or any agent, subcontractor or other third party that received the Instrument as a result of this Agreement.

17. No Assignment. Requestor may not assign its rights or delegate its duties under this Agreement to anyone else without the prior written consent of NTC.

18. Entire Agreement. This Agreement sets forth the entire agreement of the parties with respect to the subject matter hereof and supersedes all prior or contemporaneous

writings, negotiations, and discussions. Neither party has relied upon any such prior or contemporaneous communications.

19. Amendment. This Agreement may be amended only as stated in and by a writing signed by both NTC and Requestor which recites that it is an amendment to this Agreement.

20. Severability. If any provision in this Agreement is held invalid or unenforceable, the other provisions will remain enforceable, and the invalid or unenforceable provision will be considered modified so that it is valid and enforceable to the maximum extent permitted by law.

21. Survival. Sections 5, 6, 7, 9, 10, 11, 12, 14, 15, and 16 shall survive termination or expiration of this Agreement.

22. Counterparts. This Agreement may be executed in one or more counterparts, each of which will be deemed an original and all of which will be taken together and deemed to be one instrument.

Transmission by fax or PDF of executed counterparts constitutes effective delivery.

DocuSign Envelope ID: 7D8317C4-FF9B-4703-A3A2-B795C3EDE282

NEW TEACHER CENTER

By:
Name: Phillip G. Lee Name:
Title: Corporate Controller Title:
Date:

NATHANIEL R. LANEY

In witness whereof, the parties have executed this Agreement:

DocuSign Envelope ID: 7D8317C4-FF9B-4703-A3A2-B795C3EDE282

5/9/2017

Appendix D: Interview Questions for Principals

My name is Nathaniel Laney and I am completing my doctoral research at the University of Maryland College Park and I am investigating high school math and science teachers' perception of working condition factors that influence their decision to remain in teaching and the influence of the principal on these working conditions.

As a part of this study, I will need your participation in a 60 minute face to face interview to collect descriptive information about what you do as a principal to influence teacher retention in your building. Please read the questions listed below.

1. Tell me a little about your background in education.
2. How long have you been a principal? Is this your 1st principal position?
3. How would you describe your working relationship with your staff? Talk a little about your strengths and areas of need.
4. Explain the working condition factors that you believe you influence. For example: teacher collaboration, professional development, or mentoring.
5. Describe the areas you feel you don't have influence?
6. Do you feel you share a vision with teachers? Can you give some examples?
7. Describe the student achievement data of your school. In your opinion, do you think student achievement data impacts teacher retention in your school?
8. Do you consciously make an effort to keep teachers? What do you do?

Appendix E: Email to District B principals requesting teacher emails

Dear Principal LAST NAME,

My name is Nathaniel Laney. I am completing my doctoral dissertation at the University of Maryland College Park and request your assistance with collecting data. I am requesting that you voluntarily email me a list of all math and science teachers and their email addresses.

Using their email addresses, I will ask high school math and science teachers to voluntarily respond to an anonymous survey for use in my study. My study will investigate teachers' perception of working condition factors that influence their decision to remain in teaching and the influence of the principal on these working condition factors.

The survey will take approximately 30 minutes to complete. The results of the survey will not be linked to an individual. A copy of the survey has been attached for your review.

The results of the study have the potential to identify working condition factors and principal behaviors that may assist with increasing teacher retention in the school district. When the study is complete, I will gladly share the results of the study.

All responses will be kept confidential. The only people who will see the raw data including myself are Dr. Pat Richardson, my advisor, and Dr. Duvon Winborne who will assist me in the statistical analysis. All responses will be coded and maintained on the Qualtrics platform.

This study has been approved through the Prince George's county Instructional Research and Data department and the University of Maryland Institutional Review Board.

If you have any questions or concerns about the study or survey please contact:

Nathaniel Laney nlaney@umd.edu or 301-655-1095.

Appendix F: Invitation to District B teachers to participate in the survey

Initial email

Dear High School Mathematics or Science Teacher,

My name is Nathaniel Laney. I am completing my doctoral dissertation at the University of Maryland College Park and request your participation in an online anonymous survey to investigate high school math and science teachers' perception of working condition factors that influence their decision to remain in teaching and the influence of the principal on these working conditions.

The survey will take approximately 30 minutes to complete. The results of the survey will not be linked to an individual. A copy of the survey has been attached for your review.

All responses will be kept confidential. The only people who will see the raw data including myself are Dr. Pat Richardson, my advisor, and Dr. Duvon Winborne who will assist me in the statistical analysis. All responses will be coded and maintained on the Qualtrics platform through the University of Maryland.

The results of the study have the potential to identify working condition factors and principal behaviors that may assist with increasing teacher retention in the school district. When the study is complete I will gladly share the results of the study.

This study has been approved through the Prince George's county public schools department of Testing, Research and Evaluation and the University of Maryland Institutional Review Board.

If you have any questions or concerns about the study or survey please contact: Nathaniel Laney nlaney@umd.edu or 301-655-1095.

Please click on the link.

Appendix G: Initial email to District B Principals – Survey Participation

Dear Principal LAST NAME,

My name is Nathaniel Laney. I am completing my doctoral dissertation at the University of Maryland College Park and request your participation in an online anonymous survey to investigate high school math and science teachers' perception of working condition factors that influence their decision to remain in teaching and the influence of the principal on these working conditions.

The survey will take approximately 30 minutes to complete. The results of the survey will not be linked to an individual. A copy of the survey has been attached for your review.

All responses will be kept confidential. The only people who will see the raw data including myself are Dr. Pat Richardson, my advisor, and Dr. Duvon Winborne who will assist me in the statistical analysis. All responses will be coded and maintained on the Qualtrics platform through the University of Maryland.

The results of the study have the potential to identify working condition factors and principal behaviors that may assist with increasing teacher retention in the school district. When the study is complete I will gladly share the results of the study.

This study has been approved through the Prince George's county public schools department of Testing, Research and Evaluation and the University of Maryland Institutional Review Board.

If you have any questions or concerns about the study or survey please contact: Nathaniel Laney nlaney@umd.edu or 301-655-1095

Please click here to complete the survey.

Appendix H: Invitation to District B principals to participate in the survey

Appendix I: Reminder email to Participants

Dear High School Mathematics or Science Teacher,

I am contacting you to remind you about completing my 30 minute survey regarding high school math and science teachers' perception of working condition factors. Your participation could assist to identify working condition factors and principal behaviors that may assist with increasing teacher retention in the school district.

The last day to submit the survey is DATE.

Please take a few moments to complete the survey.

Click here to take the 30 minute survey.

Thanks,

Nathaniel Laney
nlaney@umd.edu
301-655-1095

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